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THE

green scene

ORTICULTURE IN THE DELAWARE VALLEY

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the fire of fall

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THE green scene

HORTICULTURE IN THE DELAWARE VALLEY

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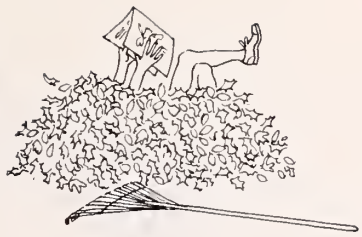
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Back cover photo by E. W. Shaffer, Jr.





EDITORIAL





a progress report

Three years ago, when we brought out the first issue of the *Green Scene,* we did so based on two articles of faith. First, that the range of horticultural interests in the Delaware Valley was sufficient enough to warrant a publication devoted to that subject. Second, that among our members and friends there were enough people with horticultural skills and writing ability to provide the articles that would be needed.





Both articles of faith have been justified. A review of the contents of our first three volumes will show that there is an endless variety of topics to be discussed without falling into the repetitious cycles that, by necessity, characterize national horticultural magazines. And our editor has frequently commented on the straightforward practicality of many of the manuscripts she has received from our members, in welcome contrast to some of the academic writing in this and other fields. Most satisfying of all, our readers have called and written in surprising numbers to tell us that they like our magazine.

The *Green Scene* has always been sent to Pennsylvania Horticultural Society members as one of the fruits of their membership. With this issue we welcome as regular recipients the members of two additional organizations: the Horticultural Society of Maryland and the Associates of the Freylinghuysen Arboretum in Morris County, New Jersey. While Maryland and Morris County are not, strictly speaking, within the Delaware Valley, their plant material and growing conditions are very much the same, and we are confident that we will have much to say to one another. We hope that these will be but the first of similar affiliations that will broaden our base and strengthen our publication.

Volume 4 will be our bicentennial volume. Already, in the preparation of the Society's bicentennial exhibits and projects, we have renewed our awareness of our horticultural heritage. Our library contains a wealth of horticultural material written and used in this region in the Revolutionary period. And quite a few of our members are experts on various aspects of horticulture and gardening in those days. During the next twelve months we hope to bring our readers articles that will help them understand the historical development of horticulture, as well as its present practice, in one of the finest areas in the world for growing plants.

Ernesta D. Ballard
President

by George H. Manaker

THE FIRE



AN EXPLORATION OF FALL

People in the Delaware Valley area often prolong the pleasure of fall color changes by driving northward to the Poconos or to New England, or southward to the Blue Ridge Mountains. In some years the colors are spectacular; in others, less intense. Many people say that early frosts promote the best display, but that is not true. Early frosts may kill or injure leaves, which diminishes rather than intensifies color.

What then, accounts for fall color?

Leaf color comes from pigments found in the leaves' cells. During much of the growing season, the green pigment, chlorophyll, dominates the leaves of most deciduous plants. Chlorophyll is found in cell structures called plastids. This green pigment is essential to photosynthesis, the food-making process in plants; without this process no other life on earth would exist. (In photosynthesis, green plants capture the free energy of solar radiation and convert it into usable chemical energy in the chemical bonds of food molecules. Plants use water from the medium in which they are immersed and carbon dioxide from the atmosphere to produce food and oxygen. The food molecules in turn provide the energy for nongreen plants, animals and man.) Synthesis of chlorophyll requires light, sugar, a favorable temperature and the minerals iron, magnesium and nitrogen.

During the growing season, chlorophyll molecules are constantly destroyed, and new ones synthesized, so that leaves remain green. As autumn approaches, the leaves' reduced physiological activity destroys chlorophyll faster than it is manufactured; the green color gradually wanes. The formerly masked yellow pigments appear and new ones may be made.

When chlorophyll disappears, leaf color may range from yellow to red, depending upon the plant. Yellow, the commonest color, was there all along, but the chlorophyll masked it. These pigments, carotenoids, exist in approximately 60 different forms, and are found in plastids, either together with the chlorophyll or alone. Carotenes and xanthophylls are the two major kinds of carotenoids. Carotenoids do not require light for synthesis, nor are they readily decomposed by light or extremes of temperature. They may persist long after the chlorophyll is gone. Yellow leaf coloration is prominent in ash, walnut, sycamore, some

OF FALL



AF COLOR CHANGES

George Manaker is associate professor and chairman of the Department of Horticulture and Landscape Design at Ambler Campus/ Temple University. Dr. Manaker's primary interests are plant growth and development; he teaches botany and plant physiology at Ambler.

birches, tulip trees, ginkgo and some maples.

Reds, blues and purples derive from another pigment, anthocyanin. This water-soluble pigment is located in the vacuole of the cell, and bleeds when cells are injured, e.g., when slicing beets. Not all species are capable of producing anthocyanin, which suggests a genetic basis. Norway maples usually have no anthocyanin, although one, 'Crimson King,' has the red pigment all season. In the Northeast, large numbers of species have genes for anthocyanin, and given the right climatic conditions, this pigment produces the vibrant reds in the spectacular fall display.

Synthesis of anthocyanin is affected by light intensity and temperature. During the warm, sunny days of autumn, sugar is made in large quantities in the leaves by photosynthesis, and sugar is essential for anthocyanin production. When the warm days are followed by cool nights, sugar use and its movement out of the leaf is slowed; the sugar accumulates. Thus, warm sunny days and cool nights favor anthocyanin formation and promote the blazing color.

The intensity of the red pigmentation is related to the concentration of anthocyanin, the simultaneous presence of several anthocyanins and other pigments, ash content, and pH of the cell sap. Anthocyanins tend to be red when acidic and blue in an alkaline medium. All of these factors help to account for the variations one sees in red coloration. Red leaves in autumn are found in numerous maples, sumac, some oaks, sweet gum, dogwood, sassafras, and euonymus. Poison-ivy may also be spectacular. In sugar maple, the orange to orange-red color is due to the presence of carotenoids with the anthocyanin, while in *Euonymus elatus,* the carotene fades, allowing the intense red color of the anthocyanin pigment alone to dominate.

As the season progresses, leaves begin to fall from the tree, and brown may predominate. Tannic acid and other decomposition products in dead and dying cells account for the brown coloration. Leaf fall (abscission) occurs when a layer of cells at the base of the petiole separate, causing a zone of weakness. The leaf then breaks off and is carried away on the autumn breeze leaving naked branches whose dormant buds await the return of spring.

●



color : more than meets

The mind is bombarded with color during every waking moment, yet we are not always aware of its impact and rarely do we take time to understand its influence. The advertiser, however, has made a study of color, is very much aware of the effects of this powerful stimulus and uses it to manipulate us to respond favorably to his product.

Advertisements for oranges appearing recently in magazines have been amazingly beautiful. One that comes to mind features a larger-than-life exposure of the interior of the fruit. The colors are so vibrant that the inner chambers of the fruit appear to be bursting with energy from the sun. I recall beads of moisture glistening on the orange as the zoom lens of my mind's eye penetrated still further into its chambers. They seemed to magnify its power, its refreshment.

Imagine being in a small room surrounded by walls that have been painted the same intense color of orange. Escape! The way the mind responds to color in various situations is fascinating. The study of color and my observations of its impact on the emotions has led me to appreciate that color is no simple matter.

The advertiser sold the oranges by creating a state of mind. We are now being introduced to a new and more restful state of mind—the world of "un." First it was "un-cola"; now "un-color" is becoming fashionable. The "un-color" look is one of soft muted colors, an acceptance of quiet colors, colors grayed and toned down. This recycling of color trends of the early 1900's is in considerable contrast to the acid colors of the late '60's and early '70's.



The dynamic contrast of psychedelic combinations seen in advertising in recent years and the "un-color" of the present is reflected in the color choices made by flower arrangers. My earliest recollection of a general use of quiet colors by arrangers was at the 1974 Harvest Show—grayed blues, muted greens and pastels were selected, browns combined with tans and buffs. Not one designer chose colors at full chroma to dominate her color schemes, even in the class, "Fall Polychrome"! There were many colors used in each exhibit in the class, but there was not the riot of intense colors that one might expect when compared with similar designs in past years. This complete reversal of color choice made by exhibitors in the artistic division made the '74 Harvest Show unique in my mind and could be paraphrased in the statement, "Flower arranging, being a living art form, reflects the spirit of the times."

Powerful colors are stimulating, command our attention, can bring instant pleasure and make us feel alive. Highly saturated colors may, however, mask faults in a design for the casual observer. The total story appears to be told quickly, the mind is satisfied without thorough inspection and moves on to something else. The joy of incorporating colors that are less intense is that they free the mind to linger and explore unique textures. The eye returns again and again as the complete story slowly unfolds—our pleasure is not short-lived.

I like to think of color like icing on a cake—it is applied last. When selecting materials for a flower arrangement, designing a garden around the patio or decorating an indoor living area, keep in mind that the composition is principally one of space, form and texture; then color is superimposed on it. The shape and form of the materials to be assembled are the basic ingredients, textures seasoned with interest and

the eye

Check Priscilla-Gene W. Shaffer's attractive arrangement on the back cover for its subtle colors. Included in the arrangement are: leucothoe leaves (with glycerine), yellow chrysanthemums and dried celosia, hydrangea, grasses, annual statice, yarrow, goldenrod, and hazelnut clusters. (After goldenrod has been air-dried, store it, uncovered, in a damp atmosphere if a muted yellow tone is desired.)

color adds life and drama. Since color creates a first impression by visually affecting the size, balance and harmony of these materials, color—like the icing—should be applied with caution.

The cover of the '74 July-August issue of our own *Green Scene,* an almost monochromatic green photograph of the Ladew Topiary Gardens, exemplifies how quiet releasing colors permit the eye to travel among form and textures. The eye begins its journey over the mottled textures of the bold forms of pruned evergreens in the foreground. It moves to a quiet pool reflecting light from the sky, across the smooth expanse of lawn to the intricately clipped hedges. The contrast of form and color of the people beyond the hedge pulls the eye into the background. The eye continues down the slope, then up again to a gazebo contrasted against a backdrop of trees in the distance. This "advertisement" for horticulture in our area offers something new for the eye each time we see it.

If color is chosen giving thought to its impact on the emotions, we will respond more fully to the surroundings we create for ourselves. We can enjoy both the radiance of color in the summer sun and the subtlety of color in the bare branches of winter. We will concede that we experience an immediate sense of well-being, cheerfulness and the warmth of the sun when we enter a room decorated in bright yellows. This reaction is even more pronounced in snowy January. On the other hand, I have found that on hot days one can experience relief from the pounding heat by making designs with iris leaves, placing them in a shallow container with a visible expanse of water. Simply working with the quiet green of the leaves, introducing no colorful floral materials and seeing the leaves reflected in the water, produces a cooling effect. Try it.

Of course, response to color is a personal matter. The main garden at the Philadelphia Flower & Garden Show usually heralds the emergence of new life of spring with vibrant reds, oranges, purples and yellows, a vivid contrast from the sleeping browns and grays of the winter landscape. For the '74 Show, however, the designers chose a more subtle approach. The pink, white and lavender tulips that dominated the scene did not shout, "Spring is here!", but spoke softly of the delicateness of spring. I felt calm, peaceful, almost reverent as I moved slowly through the garden. Some time passed before I became aware of the magnificent water-sculpture near the end of the garden. The clear waters were cascading over the sculpture as though moving down a mountain from the melting snows of springtime, a source of life for all below. The memory of this pleasurable experience of more than a year ago returns again and again.

Although color affects not only what we see, but how we respond to what we see, it is necessary to keep in mind that beauty is more than "color-deep." We must not allow color to camouflage weaknesses or confuse our judgments—we must look beneath the surface. It is through careful study, and exposure to the works of skilled individuals that we gain a better understanding and appreciation of the subtle relationships of form, texture and color. There is more to color than meets the eye!

●

by Priscilla-Gene W. Shaffer

Priscilla-Gene W. Shaffer teaches flower arrangement at the Ambler Campus/Temple University. She retired the Jackson and Perkins rose trophy at the 1975 Philadelphia Flower & Garden Show, having won it for three successive years. One of her rose arrangements will appear in the 1976 Bicentennial Vision of Beauty calendar of the National Council of State Garden Clubs. Mrs. Shaffer recently began to explore the problems of color when she became aware of the impact that commercial use of color had on the average consumer.

by Michael J. Balick

THE HENRY FOUNDATION FOR BOTANICAL R



Kalmia latifolia, narrow leaved variety. Note leaves.



Kalmia cunneata

Tucked into a wooded section of Gladwyne lies one of the least known, and perhaps one of the finest botanical gardens in the Philadelphia area. On the grounds of the Henry Foundation for Botanical Research, you will find unique native North American plants, collected in the wild by the late Mary Gibson Henry, a local botanist of international note. The collection includes many species not commonly found elsewhere in cultivation. Some of these plants have been rescued from possible extinction in the wilds and introduced into cultivation in this garden.

Mrs. Henry began collecting in the 1920's. To insure preservation of the collection, it was officially incorporated as a foundation in 1950. The majority of these plants are from the Southern part of the United States, although plants from many other sections of the country can also be found here.

The Foundation encompasses an area of 27 acres, including woods, open fields and streams. A professional staff headed by Josephine Henry, daughter of the founder, operates the garden and sees that the plant collection is enlarged, preserved and maintained.

Saving rare native plants from extinction, propagating and distributing them to selected botanical gardens throughout the world, is a prime goal of the Henry Foundation.

Several things immediately interest the horticulturally knowledgeable visitor to the Foundation. One is the number of plants that he or she might never have seen before; another is the fact that as splendid a garden as this can be built around the plants native to America, without depending on those "vital" Asiatic and European species.

Although countless numbers of the Foundation's plants deserve mention, I shall only briefly discuss some of those that particularly fascinated me.

The collection of native rhododendrons deserves first mention. Most of the rhododendrons have been selected for their uniqueness of flower color, form or habit, as well as their extended bloom time. These plants provide color in the garden from May until August. Included in this group of deciduous plants are *Rhododendron nudiflorum,* the Pinxterbloom azalea; *R. speciosum,* the Oconee azalea; *R. atlanticum,* the



RESEARCH a botanical garden in Gladwyne



racemosa, a view from the pinnacle of the rock garden.



Conradina verticillata

photos by author

Coast azalea; *R. canescens,* the Piedmont azalea; *R. roseum,* the roseshell azalea; *R. calendulaceum,* the flame azalea; *R. serrulatum,* the Southern Swamp azalea; *R. viscosum,* the swamp azalea; and *R. prunifolium,* the plumleaf azalea. White, yellow, orange, pink, red and all shades between can be found at some point during the summer season. Hybrids of this group, created by Mrs. Henry, are also included in the collection. Not to be missed in late June is the rare evergreen *Rhododendron chapmani,* a vibrant pink flowered, low growing shrub from Florida.

The genus rhododendron is classified in the family *Ericaceae,* and two other genera of this family, vaccinium (blueberry), and kalmia (mountain laurel), are well represented at the Henry Foundation. Of particular note, a large sized specimen of the willow-leaved form of *Kalmia latifolia* can be found here. This specimen is distinguished by its slender oblanceolate leaves, which give the plant a very delicate appearance. Another species of interest, *Kalmia cuneata,* is a deciduous member of this genus, which is rare in the wild.

A native of Florida and Louisiana, *Illicium floridanum,* the Florida anise tree, is an evergreen shrub that grows as tall as 9 ft. In July the aromatic leaves are partially obscured by the red, starry flowers that turn into pleasant smelling seed heads later in the summer.

Conradina verticillata, ground rosemary, located in the rock garden, is a low growing, evergreen ground cover that is smothered with lavender bilabiate flowers in June. The foliage is needle-like and quite aromatic. The plant is native in Tennessee and Kentucky.

Elliottia racemosa is another of the unique shrubs found in this garden. It is rare in the wild, being found in only a few locations in South Carolina and Georgia. Donald Wyman in his book, *Shrubs and Vines for American Gardens,* writes that the elliottia ". . . had been termed one of the rarest shrubs in the world; in its native state at least, very few plants have been found." It grows to about 10 ft. tall and in late July or early August is covered with many upright white racemes.

Berberis swaseyi is a low growing

continued



Seed pod of *Illicium floridanum*



Illicium floridanum in flower.

shrub native to Texas. The color of the leaves, a flat glaucous green, in my mind, makes the plant well worth cultivating.

Tradescantia rosea var. *graminea* is a small, delicate plant located in the rock garden. It has grass-like foliage and tiny pink flowers; the entire plant is no more than a few inches tall. It grows in South Carolina in sandy areas.

Ungnadia speciosa, the Mexican buckeye, is a shrub or small tree native to Texas and Mexico. It has mildly fragrant, rose colored flowers, which open before the leaves, combined with interestingly shaped seed pods. Both these features make it a distinctive plant.

Among other plants of interest are *Quercus turbinella, Litsea aestivalia, Arbutus xalapensis,* and a fine ilex collection.

The above, as previously mentioned, are only a few of the plants worth seeing. The most colorful displays are found during the first few weeks of May when many of the native rhododendrons are at the height of their bloom. However, continually throughout the summer season, plants are always in bloom.

In addition to the public, botanists also come to use the collection in their research. Among professionals it is a highly regarded institution.

Besides tours of the collection, The Henry Foundation for Botanical Research offers a course in native American flora, and has a yearly autumn dried plant sale of native American materials.

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The Henry Foundation is open to visitors from 10 am to 4 pm Tuesdays and Thursdays; other times by appointment only.

Michael Balick spent a summer working at the Henry Foundation. After he completed his horticultural studies at the University of Delaware in December 1974, he participated in a work study program at Las Cruces Tropical Botanical Garden in Costa Rica. He worked there from January to July '75. Balick will continue to study botany at Harvard University and will probably supplement his studies with practical training at the Arnold Arboretum.

test your HORTICULTURAL I.Q.



Can you name this plant?

If you know the correct answers to 20 or more of the following horticultural questions consider yourself an expert horticulturist. Most of the questions came from information covered in the *Green Scene* during the past two years. We tried out the quiz on a group of gardeners picked at random. Their background in horticulture ranged from no formal training to persons with associate degrees. The results were surprising; we found little correlation between training and score. Obviously, those who read the *Green Scene* on a regular basis are learning a great deal.

Try the quiz and see how you score.

20-25 correct	You're an expert.
15-20 correct	You're doing well.
12-14 correct	You're satisfactory.
Less than 12	Try again.

horticultural quiz

1. The drooping flower cluster, found on a willow or birch, is called a _____.
2. Plants that attach themselves to other plants and derive their nourishment from rain and the accumulation of organic matter collected among their roots are called _____.
3. A plant is deficient in _____ when its green leaves turn yellow while the leaves' veins remain green.
4. The botanical name for the genus of maples is _____.
5. The asparagus fern and the spider plant are members of what plant family?
6. It is beneficial to let the cut ends of geranium cuttings dry for several hours before they are placed in the rooting medium. True or false?
7. A fruit tree trained to grow horizontally without side branches is referred to as a _____.
8. Plants that have separate sexes such as ilex are called _____.
9. The fruit on a rose bush is called a _____.
10. An insecticide or fungicide that is absorbed by the plant and continues to act over a period of time is called a _____.
11. The botanical name for star magnolia is _____.
12. When dividing peonies the clumps should be set so that the eyes are no lower than _____ inches below ground level.
13. In the Philadelphia area the safe date for putting house plants outside is approximately the 15th of _____.
14. When repotting container-grown plants use a container that is _____ or _____ inches larger in diameter than the previous container.
15. *Elaeagnus angustifolia* is commonly called _____.
16. When forcing bulbs, they should be kept in a cool dark location for at least _____ to _____ weeks.
17. Through the process of _____ plants use energy from the sun to produce their own food.
18. The practice of mounding soil up around the stems of celery to keep them tender and white is called _____.
19. When growing clematis it is important to keep the roots _____.
20. *Metasequoia glyptostroboides* is commonly called _____.
21. A bulb-like underground stem without scales is a _____.
22. House plants not under artificial lights should be fed from March through _____.
23. Plants that reproduce asexually, but which originate from one seedling are called _____.
24. _____ is the source of energy for plant growth.
25. The European bark beetle carries _____ disease.

Questions prepared by Ed Lindemann

See answers on page 32.



Gleditsia triacanthos

Adventures in Tree Improvement

In films and novels "adventure" means speed and action. So, it's not likely that people think of tree breeding as an adventure. Tree improvement takes time, often a couple of decades for a single advance. Once the patient breeder adjusts to the time scale, however, he can find adventure. Breeding new annual plants can be a fast-moving project; particularly for genera that are quick to bloom, like petunias. With the use of warm greenhouses in winter, it is possible to run through several generations in a single year. In the case of trees that are slow to reach reproductive maturity, 20 years or more may be required to flower the progeny of a given cross. The slowness does have one big commercial advantage, however. Once you achieve a superior innovation, the competition is stuck in the rear position!

In an enterprise as time consuming as tree breeding, continuity is an enormous advantage. My brother and I are the third generation to operate the Princeton Nurseries, our family firm, and even today I am using as parent trees varieties that were produced by my grandfather at the turn of the century. My father has told me of his father pointing out to him when he was a small boy two American elms growing side by side, one almost defoliated by the elm leaf beetle and one almost untouched. Since the American elm was the most important shade tree in that period, it was natural that his efforts were directed toward that group. The Princeton elm was his creation, vigorous and shapely in growth, and highly resistant to the elm leaf beetle. With the accidental introduction of the Dutch elm disease, elms rapidly declined in importance and we focused our attention on other trees.

honey-locust

With elms on the back shelf, my first interest was to find trees to replace them in landscape and in street use, trees to duplicate the elm's form and its light dappled shade that was so kind to lawn grasses underneath. An obvious candidate was the honey-locust *(Gleditsia triacanthos)* with which the Siebenthaler Nurseries had done pioneering work. The normal wild type of honey-

by William Flemer, III

William Flemer, III, is president of the Princeton Nurseries, Princeton, N.J. Some of the problems and pleasures of plant breeding are dramatized in part in the soon to be released PHS film, "How Long is Always: A Story of Trees," which includes Flemer and his son in scenes shot at the Princeton Nurseries.

Flemer is active in many professional and trade associations including membership on the board of directors of the Arnold Arboretum, Harvard University, and as a Fellow of the Royal Horticultural Society.

Flemer has written two books, which are available through the PHS Library: *Nature's Guide to Successful Gardening and Landscaping* (Crowell, N.Y., 1972) and *Shade and Ornamental Trees in Color* (Groset & Dunlap, 1965).

photos courtesy Princeton Nurseries



Zelkova serrata 'Village Green'

Gleditsia triacanthos 'Shademaster'



locust is densely set with long, dangerous thorns, and usually bears quantities of long pods that create an untidy litter in the fall. Occasional thornless trees do occur in the wild, and there are other rare individuals that bear only male flowers and are therefore seedless. My objective was to combine these two highly desirable traits in a tree that also exhibited the tall "wine glass" shape of our finest elms. Thousands of seedlings were grown from a thornless parent tree and from these, 23 of the most vigorous and shapely ones of all were saved for further testing and reproduction. After a number of grafting tests, we selected nine trees. The nine had reproduced the shape of their parent trees and were also sturdy enough to grow straight without staking. These trees were planted out to grow on to flowering age. At this point, most of the remaining trees exhibited moderate to heavy pod production, and we dropped them from further consideration. (One, however, was shipped to South Africa where the clone is now grown in semi-acid areas to produce livestock feed.) The tree finally selected was named the Shademaster® Locust and it is now a standard tree for city planting; it is tough, drought-resistant, and highly tolerant of polluted city air.

zelkova

South of Philadelphia, however, the honey-locust is frequently a host to the mimosa web worm, which causes partial to heavy defoliation in bad years. For these areas, now also infested with Dutch elm disease, another replacement tree was obviously necessary. Many years ago Dr. Wyman of the Arnold Arboretum had recommended the Japanese zelkova or keaki tree *(Zelkova serrata)* as a promising possibility. It is

continued



Malus 'Snowcloud'

a close relative of the elms, rapid growing and does not get the elm disease. I therefore imported seed from Japan and set about growing zelkovas. The results were disappointing to say the least. The seedlings were crooked and unsightly in growth habit, requiring costly staking to get a tree suitable for shade tree use. At this point, I had an unexpected visit from Dr. S. K. Hyon of the Institute of Forest Genetics of South Korea, who had come to look for new trees to plant in his country. During the course of his visit, I discussed our zelkova problem. He explained that, like many of our native trees, such as Douglas fir, there were a great number of local races of zelkova varying enormously in growth rate, hardiness, and most important, in form. He promised to send seed of the best of all the Korean timber races (for it is one of the most important timber trees there). These seed were duly received, sown, and the resultant seedlings planted out for growing on and observation. From the more than 6,000 seedlings produced, the seven best were selected for grafting and further testing. Several, though vigorous enough, proved to be weak-wooded in ice and wind storms. An unusually severe and sudden winter freeze injured the remaining selections except for one that was completely unharmed. After further propagation and testing, it was introduced as the *Z. serrata* 'Village Green.' It beautifully reproduces the straight trunk and "wine glass" crown of our American elm, grows rapidly, transplants with ease, and is tolerant of city pollution. It has proven unexpectedly cold hardy and can be successfully used where the ordinary seedling zelkovas will not survive.

crab apples

The ornamental flowering crab apples are one of the most important of all our flowering trees. In the large central part of this country, where Japanese cherries and dogwoods will not thrive, they are virtually the only showy flowering trees for landscape use. There are plenty of varieties in the nursery trade, indeed some say there are too many. One type, however, was conspicuously absent, a really good double-flowering red. As in cherries and hawthorns, the double flowering varieties are best for their floral display because the flowers last longer than single-flowering varieties and are much more showy. With the objective of producing a double-flowering red, I crossed the best-colored single red of that era, Almey, with the best double pink, Katherine. We planted 2,200 seedlings out in long rows, and after eight years' growth they began to flower. They exhibited every possible color combination and a fascinating array of growth habits and fruiting patterns as well. To my delight, several double reds also appeared, varying, of course, in color intensity, growth habit, and branching pattern. Following reproduction by grafting and some years of additional evaluation, the best of them was selected and introduced under the name 'American Beauty.' It has very large double red flowers and an upright habit of growth that makes it especially useful for street planting. The foliage is red when it opens and turns a bronze-green when mature. Being double, it is partially sterile and is hence a sparse fruiter, a desirable quality for street use. Two other progeny of this same cross, a vigorous double pink and a double pure white, were so spectacular in flower that they too were introduced under the names 'Pink Perfection' and 'Snowcloud.' Both flower so heavily as to hide the branches, are deliciously fragrant, and are the equal of the finest Japanese cherries when in bloom and are, of course, much hardier. Being partially sterile, they are light fruiters and hence bloom heavily each year, in contrast to the heavy-fruiting crab apples which tend to be alternate-year bloomers.

Malus 'Pink Perfection'





Crataegus oxyacantha 'Crimson Cloud'

hawthorns

Hawthorns are among our toughest and hardiest small trees, but their floral display is rather limited, since almost all species have only white flowers. The one good red older variety is the 'Paul's Scarlet' hawthorn *(Crataegus oxyacantha pauli),* with its abundant double flowers. Unfortunately, in our eastern states this tree is defoliated in humid summers by a leaf spot fungus. It is not killed, but it is unsightly from July on with its bare, leafless branches. In view of fine performance of so many hawthorn species under very adverse city conditions, I was eager to broaden their color range by producing a really showy red-flowering tree that also held its leaves throughout the summer. As parent trees I selected 'Paul's Scarlet,' and a very old, but rather weak growing single red variety called 'Charles X,' which was less susceptible to the leaf spot disease. The seedling trees were duly produced and planted out in wide rows to await flowering. Trees that defoliated during the summer were chopped out as they appeared. Finally the remaining trees began to come into bloom. Most were white or a bluish pink, but a few true reds appeared in due time. These were grafted and again planted out in rows of 30 of each clone or variety to be grown on for further evaluation. All but one tree developed the typical thorny, contorted, and low branching habit of the wild English hawthorn. That one was upright in habit, had sparse and short thorns, and could easily be worked up into a small trunked tree for home gardens or street tree planting. It bore masses of single, bright red flowers, further enhanced by a white star-shaped marking in the middle of each flower. It has been introduced under the name 'Crimson Cloud' hawthorn, and it has grown well in downtown New York and Philadelphia as well as in suburban areas.

some problems

Not all tree breeding programs meet with success. For example, I had high hopes when crossing our spectacular red maple, 'October Glory' *(Acer rubrum* 'October Glory') with the silver maple *(Acer saccharinum).* I wanted to combine the brilliant red fall color of the former with the rapid growth and tolerance of a very wide range of soil types of the latter. The hybrid progeny showed marked fall color improvement in some cases, and they grew as fast as silver maples. Unfortunately, they were just as brittle and subject to storm damage as silver maples, too, so they were not promising for street planting. Crosses between scarlet and pin oaks to combine the brilliant fall color of the former with the pin oak's ease in transplanting was also a failure because the best seedling produced could not be vegetatively reproduced. Grafting on scarlet oak seedlings, of course, gave plants with the scarlet's characteristically poor root system. Grafting on pin oak seedlings gave poor graft unions that showed incompatibility and failed as the trees grew older.

Nevertheless the lure of new challenges continues unabated and many more lifetimes of new work beckon. Current projects include the production of a really deep pink shadblow or serviceberry (amelanchier) using the existing quick-fading pink varieties as parents. Another is the production of a red horse-chestnut hybrid and a white horse-chestnut that are not disfigured by leaf rust disease in summer. Provided one can attune oneself to the leisurely time scale of the trees, there are plenty of adventures ahead in tree breeding and improvement.

the evergreening of thirty acres



Two camera-shy deer take off past the Memorial Day pines that were brought from New York State in coffee cans.

by Alexander L. Crosby

Alexander L. Crosby is a former newspaperman who has been a writer of children's books for nearly 20 years. His wife is Dr. Nancy Larrick, a Lehigh University professor and the author of *A Parent's Guide to Children's Reading.*

The real estate agent was puzzled when, after my wife and I had examined the old stone house and the barn, we said we wanted to take a look at the woods. Since the woods covered more than half of the 30 acres, a viewing seemed essential to us. We had no idea what trees and shrubs grew in them, and what flowers might be expected in the spring. The property was at the northernmost part of Bucks County, Pennsylvania, two miles from Quakertown.

It was a chilly day in November 1959 when we set out, the realtor trudging faithfully. I saw some dull green ahead, among a few beech trees. "Rhododendrons!" I said to myself, afraid to proclaim my discovery before it was secure.

In a few years the trees were large enough to inspire Yuletide designs in the head of a thrifty neighbor, who helped himself on a December evening and returned the following year for another tree.

My restraint was appropriate, for the green spot turned out to be honeysuckle. There was not a rhododendron in the woods. There was no laurel. There were no hemlocks, no hollies. One small white pine, hemmed by sassafras, grew close to the macadam road. The only other evergreens were three or four dozen red cedars scattered through a field next to the woods.

But the land promised so much more than the windowbox of our fifth floor apartment in Greenwich Village that we bought it. Then, year by year, good fortune and modest sums of money provided us with evergreens.

A friend told us that her neighbor had grown some hemlock trees for sale. We bought 100 little beauties, 2 to 3 ft. high and neatly bagged, for $2 each. We planted them in irregular groups, mostly along the highway. In a few years the trees were large enough to inspire Yuletide designs in the head of a thrifty neighbor, who helped himself on a December evening and returned the following year for another tree.



The arbor vita was one of the few evergreens on the property when the Crosbys bought it in 1960.

A hemlock makes a poor Christmas tree because it lacks density and because the needles soon shed. But our unidentified neighbor probably felt that these faults could be forgiven when the tree was, from his viewpoint, a gift. To discourage him or her, from returning the following year, I wrote to the Quakertown *Free Press* and asked for some cooperation from my neighbors:

If you notice a fine, fresh hemlock between 6 and 8 feet high in the house of one of your neighbors, please ask where it came from. If your friend looks uneasy and just can't remember, call me at 536-7814 and give me the name and address of the family. I won't squeal to the state police, but next December I'll send a $5 check so the family can buy a tree.

My letter was printed one week before Christmas 1969. Nobody telephoned me. And nobody has taken a hemlock since. Further, it turned out that we did not lose the two trees after all. Both had been neatly sawed off about 6 in. above ground, leaving the two lowest branches. Gradually these branches curved upward like the arms of a lyre. Today we have two handsome, bushy trees, each with twin trunks.

Pine trees move me as much as Sibelius's "Finlandia." A place without pines is like an art gallery without paintings. So, early in our country life, I began looking for pine trees, warmly encouraged if not constantly prodded by my wife, whose eyes are at least one

continued

the evergreening of thirty acres



The hemlock at Barbara Deuble's right was sawed off a few inches above ground by a Christmas tree thief, who left the two lowest branches.

shade greener than mine.

We started out in an honest way, buying white pines and Scotch pines from nurseries and from moonlighters. Two Douglas firs were happy acquisitions, serving first as Christmas trees. Gradually we adopted a pólicy of prudent procurement without payment, observing two rules to avoid duplicating the error of the Christmas tree cutter. Rule 1 was never to take a tree that had been planted by man; Rule 2 was to dig only the trees that had no chance to develop where we found them (for example, beneath a large and healthy tree, or along a highway where mowing was done. Of course, we don't "steal" from parks or private woods.)

The seedlings we chose were seldom more than a foot tall and often much less. We put them in a small nursery area for transplanting after two or three years. Some of these seedlings, now in their permanent locations, have outstripped commercial nursery trees that were 4 or 5 ft. high when they were planted.

Our appetite for rhododendrons was satisfied—as much as any horticultural craving can be—when a nurseryman sent us a man with a truckload of small plants dug (he said) from his own acreage in the Poconos. We bought them for $2 each, planted them in open woods along our lane, and mulched them with close to 6 in. of rotting wood chips. Then we waited a few years for a handsome display of pinkish white blossoms.

We have not been successful with mountain laurel and sheep laurel, primarily because the deer enjoy them in winter even more than we hope to in spring. The rule seems to be that 2 in. of new growth are nipped off by a 3 in. bite, and at this rate a plant steadily approaches ground level. I have thought of encircling the plants with chicken wire but have been discouraged by the prospect of what these safeguards would look like. The solution may be to plant laurel where the deer don't regularly pass, as on the slope across the pond. But I suspect the deer would quickly adjust their gastronomic geography to include the new scene.

A dozen or so red cedars, from 1 to 3 ft. high, had sprung up along the bank of our small pond, which we were about to enlarge. I would just as soon kill a toad as destroy an evergreen, so we moved the cedars to make an eventual windbreak for the vegetable garden. A conscientious young man from the neighborhood dug holes that were even deeper and wider than I had advised, and he filled them with generous helpings of compost and old manure. One of these trees is now the winter roosting place of our resident mockingbird. If the cedars keep on growing at the same rate, I shall eventually have to move the vegetable garden to a place where the sun shines all day long.

Friends from the suburbs used to kid me because I planted small hemlocks and white pines so far apart. Indeed, it was often very hard to distinguish the infant trees from the weeds. But when an evergreen gets the food and sunshine it wants, the response always tops my expectations. The 2-ft. hemlocks I planted 12 years ago were irregularly grouped, 12 to 18 ft. apart. The trees



Transplanted red cedars have prospered so well that they now threaten to shade the vegetable garden.

that were put into an overworked field are now only 6 to 8 ft. high, despite fertilization, but those on uncultivated soil higher up have soared to 20 ft. and more. There is no space for walking among them.

My only error in spacing evergreens has been giving them too little room. It is especially important to keep them clear of deciduous trees which can grow even faster. We are now faced with the choice of moving a couple of white pines or cutting down the white ash trees that have expanded into their territory. This horticultural knot will, I am sure, be cut with an ax—more properly, a chain saw.

Let me conclude with a few kind words for our neighbors and friends, all of whom have recognized that we have plenty of plantable ground. Bill Musselman, a young man who spurned cut Christmas trees but had no land for planting live ones, donated three spruces in that many years. All have flourished (I usually dig and fertilize the holes well before the ground freezes).

A man I have never met, whose name and address in Montgomery County I got from a local tax collector, sold us by mail a splendid English boxwood from an abandoned farm. For this treasure I dug an equally splendid hole next to our barn, removing brickbats, stones, and other infertile material to a depth of 4 ft. and then filling with compost, topsoil, and rotted wood chips. A nursery crew moved the shrub, with a winch. I built a cover against the winter sun for several years and then decided that the northwest wall of the barn was enough protection against burning. There hasn't been a brown leaf yet.

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by Bebe Miles

Bebe Miles is on the executive committee at Bowman's Hill State Wildflower Preserve and currently heads the committee that takes care of their Bluebell Trail for the Doylestown Nature Club. Her book, *Bluebells and Bittersweet,* covers the best American plants for home gardening. A craft book, *Designing with Natural Materials,* is being published this year.



photos by author



Mixture of *Crocus speciosus* varieties pops out of thyme.

Seedling plant of *Dianthus plumarius* was put in at same time as *Crocus speciosus albus* bulbs. By next year the dianthus will have made large mat of foliage to set off crocus.

Sternbergia's leaves are just developing at flowering time.

Bunches of flowers of *Colchicum autumnale* are displayed well in thyme patch.





bulbs
to brighten the fall

There is no such thing as instant gardening, but the bulbs that produce flowers in the fall come close. Here in the Delaware Valley all of them are worth trying. Most important genera are sternbergia, crocus and colchicum.

All are perfect to liven up gardens that may grow somewhat tired by the end of the summer. The latest to blossom provide a last brave gesture of color before the snows arrive.

These bulbs qualify as "quickies" because they are available in late summer. Planted immediately on arrival, they will bloom that fall, some within a few weeks even, although established colonies tend to flower sooner than those newly-planted.

Two techniques make for success: position those that have winter foliage where they will get maximum sun during the snowy months and provide ground covers as foils for those that flower without any foliage.

Although snow cover is a sometime thing in much of our area, certain spots in your garden always get less snow than others. Snow melts first and sunshine is strongest on a south-facing bank. House wall, large rocks, even thick evergreens to the north guarantee a mini-climate ideal for the crocus and sternbergia. The colchicums, which do not show leaves until early spring, may go in either full sun or half shade since most of their leaf production is done before the trees cast full shade. In the southern half of our area some afternoon shade definitely prolongs the bloom of both the colchicums and the earlier-flowering crocuses; a sizzling day in full sun can wilt their petals too quickly.

You could plant any of these bulbs without a ground cover, but most of the autumn crocus and all the colchicums flower without leaves of their own. They are much more effective if allowed to pop out of a patch of green of some sort. One way to accomplish that is to plant the ground cover at the same time you put in the bulbs. Or if the companion plant is already in place, lift it here and there and tuck the bulbs in around its periphery, taking care not to disturb the central roots of the cover plant.

Any plant that is not too tall in fall to hide the bulb flowers can be used as a ground cover. Mat-forming dianthus is a particular favorite of mine. Other suggestions: *Vinca minor,* arabis, armeria, *Phlox subulata,* thyme, saponaria and ajuga. Dwarf white alyssum is a wonderful accompaniment for all of them, especially in quantity. Since it seeds itself generously, it is almost as dependable as a perennial after it is once started.

Sternbergia

Sternbergia begins blooming sometime around the middle of September. If the weather is not too hot, a colony will produce color for several weeks. It is a bright yellow, as gay as any of the springtime crocus, but it is an amaryllis. Its cups are perhaps 2 in. across and borne on stout stems that may elongate to a good 6 in. Most bulbs offered in this country show a little foliage with the flowers.

Although they are less than an inch wide, the leaves are the typical strap-like ones of an amaryllis and grow to nearly a foot long as the winter progresses, making a nice green accent. The farther north you live the more imperative it is to give sternbergia a sunny niche for the winter. By the end of May the leaves begin to brown up; mark its place lest you disturb it during summer dormancy.

Here at Doylestown I have a patch of sternbergia that does not yet appear too crowded after eight years of growing, but southern gardeners report increase is faster. The time to divide crowded bulbs is just as the leaves die down. Replant immediately about 4 in. deep, 4 in. apart.

Like its daffodil relatives, sternbergia does not appeal to hungry rabbits. The autumn crocus are not as lucky, and many a patch peters out because the leaves are nibbled all winter. A light covering of needled evergreen branches is a fairly effective deterent. Make sure it is not so thick the sun cannot penetrate.

I am talking about true crocuses, but the flower tubes of most fall species are longer than their springtime sisters. This is one reason why they look better with a ground cover as a backdrop.

Crocus

First to flower are forms of *C. speciosus.* Of them all the pure white *C. speciosus albus* is my own favorite. It has bright orange stigmata and endures the heat of early fall better than the blue forms. There are a number of the latter available. I can see little difference between them except that some have more pronounced darker veining in the petals, but the flowering times are slightly different. *C. pulchellus* is

continued

bulbs

much similar but a bit later.

Next, only a few days later, bloom begins on *C. karduchorum (leucopharynx).* Its lavender flowers are more cup-shaped than the speciosus types that form almost a star as they open. Inside are white anthers and a white base. It has proven to be an especially sturdy grower here with good increase.

C. zonatus (kotschyanus) has been inconsistent for me. I suspect not all the bulbs I received under that name were correctly labelled. The true type is a lavender with a yellow throat and fairly early. Smaller and lighter in color (almost white) is *C. vallicola,* which also has two yellow spots at the base of each petal.

C. medius is smaller in every detail than the others, but a most appealing subject to prolong the season. It often produces a tiny tuft of foliage with the flowers that are a fine deep lilac with startling red orange stigmata. It begins flowering toward the end of October. Often an early frost destroys some blooms, but others may pop up later. I have had it still in bloom after Thanksgiving some years.

C. ochroleucus will survive a surprising amount of frost, but it fared better in my Wayne garden than here in Doylestown where winter sets in a bit earlier. It is a dainty creamy flower and deserves your warmest spot.

C. sativus, the famous saffron crocus of history, gets mixed reviews from me, and I wonder if I have always had true bulbs. I have had a purple chalice of what I ordered as this one open as late as the day after Christmas in Doylestown, but bloom has never been free.

Those described above are the easiest fall crocus to locate. If you can obtain others, by all means try. Remember that the later the flowering season, the more important to give it a warm, protected spot, especially if your home is in the northern half of our area. Plant about 3 in. deep, 3 in. apart.

Colchicum

Colchicums can be a bit difficult to place in the garden because while the fall flowers are displayed best in the foreground, the spring foliage looks out of place. A hilly garden makes it easier. If you plant them halfway up the slope, the flowers show well, but the large, blowzy leaves do not offend. The most common sorts bloom late September into October.

Another clever way to use colchicums is to plant them in niches of shrubbery or even in light woodland. The flowers can poke out above the fallen leaves, and the springtime foliage (which on some varieties can reach 2 ft.) does not bother anyone.

By far the most spectacular is the hybrid waterlily, which produces a succession of deep pink lavender double flowers often 6 in. across. With annual white alyssum planted thickly around it, this colchicum is a show-stopper, and the mounds of the companion planting help support the rather heavy colchicum flowers.

Although somewhat expensive, waterlily bulbs increase vigorously. Plant the largest ones a good 4 in. deep and at least 5 in. apart. In five years they will definitely need thinning. Do this as the foliage dies down in June. I separate the bulbs, let them dry in the shaded garage a few days, then replant. It is possible to store them a month or so in a cool place; but if you wait too long, all colchicums try to bloom without being planted. Some sources tout this as a possible use indoors; it is a sorry practice and not recommended.

Also double but only about a quarter the size of the above is *C. autumnale roseum plenum.* Its color is far softer, and its tubes much shorter, so place it where it will not be overlooked. It has the neatest foliage of any. There is a rare double white form too.

Easily obtainable are single forms of *C. autumnale* both in light lavender and white. They make bunches of bloom, and common thyme is a good underplanting.

C. byzantinum (autumnale major) has larger flowers in soft rose. Forms of *C. speciosum* may be pale lilac, deep purple or white. *C. bornmuelleri* is a large-flowered sort, pinky violet with a white center.

Several hybrids have quite large flowers too. Lilac Wonder, The Giant, Rosy Dawn and Violet Queen are the easiest to locate. Many hybrids show some tessellation in the petals.

Another group of colchicums is more for gardeners in the southern part of our area. These are the tessellated species with large flowers in shades of violet and purple. *C. sibthorpi* and *C. agrippinum* are the most often offered. They are not quite as hardy, and they bloom late enough to be caught by frost.

Leaves of all these do not appear until spring. Rabbits do not seem attracted to them perhaps because the bulbs contain a powerful drug; used to treat gout and to change the chromosome count in genetics, never leave bulbs around where small children or pets might mistake them for something to eat.

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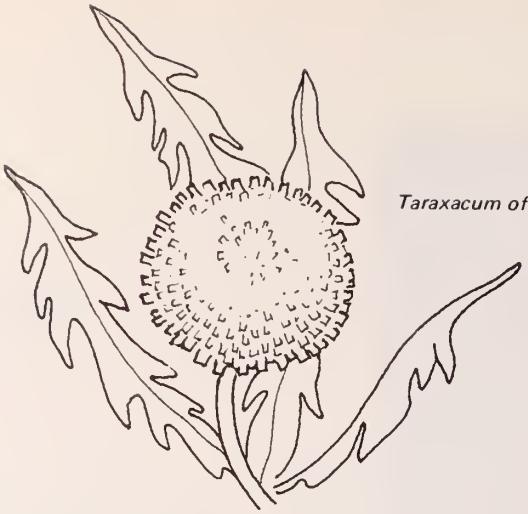


Crocus karduchorum has cup-shaped flowers.

Colchicum waterlily flowers set off by annual alyssum.

Rock creates warm spot to melt snow quickly around sternbergia foliage.





Taraxacum officinale

MY LAWN

by M. M. Brubaker

The author calculates that he has 20 hours worth of fine *[sic]* lawn and 250 hours worth of coarse field to mow. Brubaker claims that if Congress outlawed lawns this country would save more money than it did during Prohibition. His cynicism is perhaps attributable to the fact that we spoke to him the day after he ran over his wallet with the mower and had not yet disengaged shredded five dollar bills from his driver's license and some other unidentified papers.



Viola papilionacea priceana



Anagallis arvensis

Many of my friends discuss at great length their lawn problems—their weeding, their use of such chemicals as herbicides, insecticides, fungicides, and fertilizers, and other sorts of grooming. And when I look at their lawns, I am only startled at what drab and monotonous expanses they have accomplished. My lawn has real character. There's nothing monotonous about it. Outstanding is a delightful pattern of different shades of green and different leaf textures. Perhaps those several kinds of grass and other plants would make a more artistic mosaic if they were in clumps, and in a contrived arrangement, instead of being scattered around. But that is not ordained ecologically on a *laissez-faire* lawn like mine.

Even more interesting to me than this pattern of green colors and textures are the charming little flowers which appear here and there. Of course, the most showy flower in the spring is the European *Taraxacum officinale,* better known as dandelion, with its big, bright, yellow blooms and its airy, gossamer seed heads. But this is not the flower visitors admire most and ask about most often. The bright purple masses of *Lamium purpureum* attract most attention. It forms beds here and there. For example, this spring there is a circular bed of the *L. purpureum* around the base of an oxydendrum and it has the appearance of having been planted.

Another flower that forms rather dense beds at times is an *antennaria* quite aptly called pussytoes. This spring there is a circular mass of this in front of the big, spherical Prunus 'Hally Jolivette,' both in bloom together. The two complement one another.

Yellow spots of *Potentilla canadensis* are seen here and there in the lawn,

but denser areas are at the edge of the lawn along the driveway. I think it enjoys a very lean diet, or maybe tolerates starvation better than most other plants.

The forget-me-nots *(Myosotis sp.)* have undoubtedly escaped from my wife's border garden. They give real verve because that true blue color is not common, and the contrast of a blue flower and the green grass now and then is quite arresting. The tiny white stellaria, or chick weed as it is called, shines out as I search through the lawn looking for interesting plants.

Violets don't seem to persist in an open, mowed lawn, but one that I am fond of, the confederate violet *Viola priceana* continues on the edge in some shade. I think the blue and white striped flowers are about the prettiest of any of the violets. These plants have apparently naturalized from some planting a long time ago. In the same way a grape hyacinth, presumed to be *Muscari botryoides,* shows up now and then in the front lawn. Its source is a real mystery, since we have never planted it, and we settled in a farm field a considerable distance from any other garden.

So far I have only mentioned spring flowers, and spring is the most interesting time of the year for lawn flowers. However, there is some nice color in the lawn in summer and late summer: The tiny, red *Anagallis arvensis* stands out because it is such an attractive shade of red. Another late summer flower is a low hawkweed *(Hieracium sp.)* which gives the appearance of a planted daisy. The taller heads of hawkweed are cut off by the mower, but a considerable number of shorter flowers persist after mowing.

I have only mentioned some of the more conspicuous flowers, but there is a wide assortment of interesting plants with inconspicuous flowers, such as the euphorbias and some tiny flowered composites. In fact, a new plant I had not seen before turns up every now and then as I browse through the grass.

All of these attractive flowers have continued to appear year after year on my mowed lawn. A few like the grape hyacinth and the pussytoes are only conspicuous in the early spring, since the flowers are tall enough to be cut off by the mower. I mow high, however, and most of the others mentioned continue to show bloom as mowing progresses.

To achieve a kaleidoscopic lawn as I have described, care must be used in fertilizing. A lot of fertilizer does help to make dark green and lush grass, but it also causes several difficulties. Not the least of which is you will have to mow the lawn a lot more frequently. The most serious problem, though, is that lush grass crowds out some of the most attractive flowering plants. Fertilizing in late fall and early spring is especially inimical to an interesting lawn because some of the grasses grow too vigorously during the cold part of the year, and develop an exaggerated foothold that cannot be overcome by other plants later. I have some clover *(Trifolium repens)* in my lawn, and would have more if I put on a good slug of lime. However, that too would upset the ecology and would create unfavorable conditions for some of the other flowers that I enjoy.

Let's initiate a movement against the drab and monotonous lawns so popular today. When we consider the effort and money expended in this country to attain lawn monotony, and the economic waste involved, we should realize what great gains are possible by relaxing and enjoying our lawns as horticultural areas.



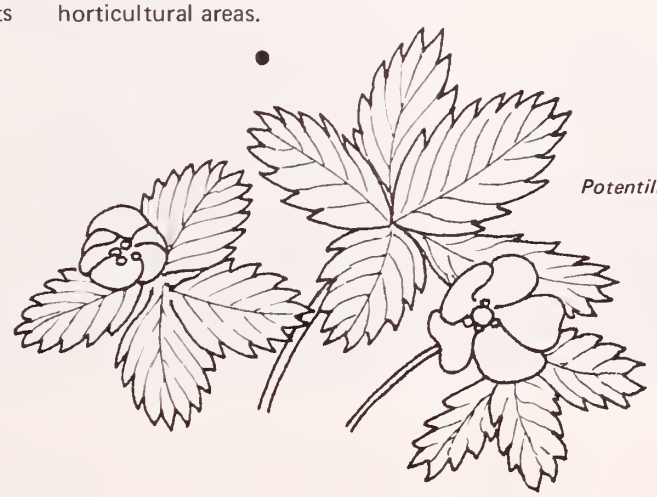
cartoon by Robert Brubaker



The Brubaker lawn



Stellaria media



Potentilla canadensis

Yellow or Red for Autumn:

photo by G. Koller



Enkianthus campanulatus

ENKIANTHUS

Because I prefer clear intense colors in the autumn, I'm always on the lookout for plants that will spice up the show. My two favorites come from the genus enkianthus, a little known shrub group that deserves increased use.

The bright golden yellow of my autumn comes from *Enkianthus campanulatus* commonly known as redvein enkianthus. The shrub is perfect for narrow spaces needing a plant with limited horizontal spread. It generally grows 2 to 3 ft. wide and while usually 6 to 10 ft. tall it occasionally reaches 15 to 20 ft.

Flowers appear in late May as the great rush of spring bloom begins to subside. Individual flowers are small, but they occur in pendulous clusters at the ends of branches. Appearing as little bells, their color is white at the top, streaked with pink veins in the middle and blend into a solid pink lip at the lower end. A distant view of the plant is somewhat uninspiring, but a close inspection reveals a beauty and perfection so often found in the tiny flowers.

The brilliant red of my autumn comes from *Enkianthus perulatus,* which for lack of a better name I call flaming enkianthus. One often hears people talk of the brilliant color of black gum *(Nyssa sylvatica)* or winged euonymus *(Euonymus alatus)* and they are recommended for their autumn color. Flaming enkianthus equals if not outpaces their fiery display.

Pure white, urn-shaped flowers appear in early May before the leaves. While individually the blossoms are quite small, the bulk creates an attractive floral display.

When allowed to grow naturally the shape is a rounded ball. It is more attractive when pruned artistically into layers or clouds to expose the smooth, greyish branches, which are highly ornamental. This tiered, almost Oriental look, invites year-round interest. The Brooklyn Botanical Garden has a bonsai specimen that demonstrates what pruning does to enhance the beauty of this plant.

Enkianthus perulatus is a slow grower and takes years to reach any size. One plant that has been at the Morris

by Gary Koller

Arboretum for 60 to 70 years is only 9 ft. tall and 15 ft. wide. Because of its slow growth it is most adaptable to the smaller scale of the urban landscape.

These two members of the heath family thrive in the same soil preferred by azaleas and rhododendrons. The soil should be rich in organic matter, have an acid pH, and be well drained. Being surface rooters they have a shallow root system and are easy to transplant. A permanent mulch should be established and any cultivation should be done with care so as not to damage the fine roots.

Exposure can range from full sun to light shade. For best flowering and autumn coloration, however, they seem to require full sun. At the Arboretum we have several plants of each species; those in the shade do little in the autumn, but those in full sun sparkle with color.

Slow growth means that minimal pruning is needed to maintain these plants at a specific size or to create artistic effects. Both species train well and are handsome as bonsai plants. Insects and disease are of minor importance and rarely cause trouble.

Propagation presents some difficulties. We have tried cuttings on several occasions with little success and many growers seem to have the same problem. The technique of propagation by cuttings has not been worked out. Possibly an interested gardener will take the time to experiment and share the results if successful. Both species come easily from seed. We sow ours indoors in February or March in a soil mix of one-half milled sphagnum and one-half sand. Seedlings sprout quickly and grow about one-half to an inch tall the first season. During the first winter they should be sheltered over in a cold frame where they are exposed to the necessary cold period to break dormancy but will be protected from snow, winds and rodents while they are still small and relatively fragile.

Because they are in the ericaceous group these plants should combine well with azaleas and rhododendrons, and they do culturally. However, when mixed among plants with large, brightly colored flowers the beauty of the enkianthus flowers are lost. I prefer giving these plants their own spot where their quiet beauty can be fully appreciated.

Rarity always creates a problem when you look for a source. Since both species are difficult to find I suggest the following nurseries:

E. campanulatus

Carroll Gardens (mail order)
Westminster, Md. 21157

Mellinger's, Inc. (mail order)
2310 W. South Range Road
North Lima, Ohio 44452

E. perulatus

Watnong Nursery
Morris Plains, N.J. 07950
(seems to be only source available)

In October as the days shorten and become delightfully cool, bright colors present themselves in the landscape. Why not visit the Morris Arboretum to get to know the enkianthus and see the scarlets and golds that will brighten your autumn.

●

photo by G. Koller



Enkianthus campanulatus

photo by G. Koller



Enkianthus perulatus

photo by B. Graham



Enkianthus perulatus



Getting Lemon Hill Ready

by John Kistler

John S. Kistler, landscape architect, was commissioned by the Colonial Dames to research and lay out a plan for the restoration of the grounds at Lemon Hill. Kistler is also a member of the Council of the Pennsylvania Horticultural Society, and the designer of the 1976 Philadelphia Flower & Garden Show.



for 1976

photo courtesy of Fairmount Park Archive



This photo believed to have been taken around 1875 during preparation for the Centennial.

In 1973 the Colonial Dames of America, Chapter II of Philadelphia, started to restore Lemon Hill Mansion and its grounds for '76. The period selected for restoration was the turn of the 19th century, the heyday of the mansion. The land was first the property of Robert Morris, but in the late 19th century became the property of, and was developed by, Henry Pratt as his country home.

The "Plantation," or country seat, is situated on a knoll overlooking boathouse row, the Schuylkill River, Fairmount Hill, and the fair city of Philadelphia. Originally, to the south was an uninterrupted, unfenced "Great Lawn" sweeping down towards the river. A famous hothouse, long since gone, is shown in old prints to be located to the southeast of the mansion. The structure, reported to have been the largest hothouse in the United States at that time, housed tender and newly introduced shrubs and flowers as well as the lemon and orange trees during the wintertime. On the east side of the mansion was the famous garden to which Pratt willingly issued invitations of admission. On the north was the approach and entrance court.

Although no plans of the garden during Pratt's ownership are available, it is referred to in many visitor's letters during that period. One reference mentions "handsome groves of Cedar and Catalpas." Several letters mention that Pratt gave seeds of the then novel pink acacia, or mimosa tree, to distinguished visitors, which were collected from the trees in his garden. The elaborate east garden was a show ground, often mentioned in letters and documents of that period. In 1837, Andrew Jackson Downing, an American landscape architect, author of *Landscape Gardening,* and a preacher of the "English" or "Naturalistic" style, wrote of the garden: "For a long time the grounds of Mr. Pratt at Lemon Hill have been considered the show place of the city and the proprietor, with praise worthy spirit, opening his long shaded walks, cool grottos, jets d'eau and superb range of hothouses to the inspection of the citizens, contributed in a large degree to improve the caste of the inhabitants and to inspire them with a desire to possess the more beautiful and delicate productions of nature."

Although a park drive now runs around the lower part of the "Great Lawn," through where the hothouses were assumed to have been located and through the "East Garden," there still exist steps and one pool at the bottom of the east slope.

A survey made in 1870 shows a pattern that fits "long shaded walks" and the naturalistic style (see photo). Since the property had been purchased by the city for the park and used as a concession, it is assumed that few changes were made other than some practical straight walks and drives. The original approach shown on the survey was without doubt the only carriage approach at that time. We hope that the approach from Sedgely Drive can also be restored.

Using the above-mentioned information, I laid out the East Garden with curving walks, typical of the naturalistic style and in the proportions of the 1870 survey (see plan). Although this area underwent some grading changes when the river was dredged in the 1920's or 30's, sections of a former main path going down the slope were found during the installation of the new paths.

The Colonial Dames Committee felt that the basic year-round planting should be American trees, including those brought into the Philadelphia area by John Bartram. The mimosa *(Albizzia julibrissin)* was the only known imported tree to be planted in the garden and was often referred to in letters and documents. Maintenance problems and the lack of a greenhouse make it advisable to omit shrubs and flowers at this time.

The main network of paths were installed in 1974, using a screened material (finely crushed stone put through a screen for uniformity) as close to cinders that we assume were used around a country residence at that time. In the fall of 1974, red and white cedars were planted as the Colonial Dames' contribution to the 10,000 Trees Program. More plantings are anticipated in 1975, one an Elizabeth Van Pelt Memorial, one a Jean Willing Handcock Memorial and another by the Wissahickon Garden Club's contribution to the 10,000 Trees. We hope that further contributions will complete at least the "East Garden" planting for 1976.

Anyone interested can visit the grounds; they are always open. The Pratt Mansion is open to the public on Thursdays from 11:00 am til 3:30 pm or by appointment through the Philadelphia Museum of Art, Park House Department.

●



MY SUN POCKET

by Margaret W. Evans

Margaret W. Evans has studied at the Barnes Arboretum. She chairs the Preserve Committee of Bowman's Hill Wildflower Preserve and is president of the John Bartram Association. JBA helps the Park Commission to select the furniture for the historical houses in the Park and acts in an advisory capacity for the Bartram Gardens. In addition to the Sun Pocket Garden discussed here, Ms. Evans also has a wild garden at her home in Germantown.

Crocus tomasinianus

The sun pocket

photos by Henry C. Evans



Once I asked a friend what she had been doing in her garden recently. She said, "I've been developing corners." My sun pocket is a corner that almost developed itself. It is a small sunny area in an ell of our house facing southeast on our rather shady property, which has few places for sun lovers, human or otherwise. A few plants seem to have always grown there and others have been added because the location was suitable rather than with any thought of design. The previous owners of our house had left a large pink azalea whose blossoms faded quickly in the hot May sun. It was, however, surrounded by species crocuses and scillas growing in the grass. Pink oxalis *(Oxalis rubra)* filled a narrow strip against the wall of the house. In late spring, billows of cream violets *(Viola striata)* took over, choking out most of the weeds.

The azalea has been removed making space for a 9 ft. by 12 ft. random flagstone terrace laid in sand over rubble, level with the stone facing of two long cellar window wells. Space was left for narrow beds along the wall of the house and between the cellar window wells. At the outer corner, a thick square of flagstone is topped, according to the season, with a pot of pansies, portulaca or sedums, or an arrangement of conch shells and driftwood. There is room for two chairs and a small table inviting picnic lunches.

In late February and March two kinds of snow drops *(Golanthus elwesi* and *G. nivalis)* bloom followed by species crocus *(Crocus tomasinianus)* in two shades of lavender, as well as *(Crocus susianus)* 'Cloth of Gold' and *(Crocus chrysanthus)* 'Snow Bunting' and 'Cream Beauty.' Scillas *(Scilla siberica* and *S. tubergeniana)*, large white Dutch crocus, yellow *Iris danfordiae,* deep purple *I. reticulata,* and tiny *Narcissus minimus* add more color. Yellow *Jasmine nudiflorum* peeks out from behind a sheltering box bush.

By April, its moment of glory over, the sun pocket is still a welcome retreat on chilly days. Although interest has shifted to other areas, there is always something to enjoy for the rest of the year. Purple and white creeping thymes *(Thymus serpyllum)* spill over the flagstones, yellow Dahlberg daisies seed themselves in the cracks and bloom all summer and fall. Rosemary *(Rosemarianus officinalus)* thrives year-round in the innermost corner, its roots in rubble and mortar. Native honeysuckle *(Lonicera sempervirens)* clambers over a trellis against the wall, flaunting its orange trumpets from May to December. Blue-eyed grass has made itself at home while bearberry and hardy succulents promise to become established.

My sun pocket is a space set apart, a micro-climate to be enjoyed especially when the rest of the garden is cold and dormant, yet with its own year-round interest.

●

Snowdrop *(Galanthus elwesi)*





Crocus chrysanthus 'Snow Bunting'

authors shed light on plants

Roche



Photo from *The Complete Book of Gardening Under Lights* by Elvin McDonald.

by Vicki Benzel

Vicki Benzel is a charter member of the Philadelphia Chapter of the Indoor Light Gardening Society of America, Inc., which was founded in 1972. She chairs that Society's Education and Horticulture Committee. Benzel has been gardening since she was a child and has been growing plants under lights for the last six years.

She will be attending classes at the Barnes Arboretum this fall.

By now many PHS members have been exposed to artificial light gardening. For those who have not, it is well worth investigating.

We all know that sunlight is necessary for proper plant growth as evidenced by our house plants' summer migration to the patio or to garden. But how many members grit their teeth in September and drag their house plants back inside promising them "a nice sunny window" knowing full well they will never keep that lush summer growth all winter.

We consign our house plants to an environment that simply does not provide the best possible light for the best possible length of time in the winter. This deficiency forces many of our plants into maintenance growth if not actual dormancy during the winter months.

What most of our house plants need is a good long summer day, with lots of bright summer sun year-round. In lieu of moving to Florida, artificial lights will increase the amount of light available to our plants and will continue that "long summer day" during winter.

"Light" gardening, that is, using fluorescent tubes or incandescent bulbs to replace or supplement the sun in the culture, propagation and forcing of plant material, is an easy alternative to hit or miss winter gardening. It eliminates the problem of house plants stuck on drafty windowsills near heating outlets and opens the possibility of gardening anywhere in your home. Light gardeners have turned basements into jungles, created herb and salad gardens on kitchen counters and gone on to explore the possibilities of interior decoration with large specimen plants or massive plantings in all sorts of unlikely areas.

Now is a good time to research and plan such a garden. Like any other new subject the best place to begin is by reading the available literature. While gardening with artificial light is a relatively new field in horticulture it has been tackled by some competent and enthusiastic authors. Most of the books not only describe the basic relationship of light and plant growth in layman's terms but also give detailed instructions for soil mixes, watering procedures, propagation and possible garden designs, as well as exhaustive lists of plant material that will thrive and bloom under artificial light.

The books described here are those most frequently circulated from the PHS library. The library has almost everything written on the subject that is reasonably available. What I have written is of necessity more a survey of the literature than a critical analysis. Because light gardening has only recently begun to develop, research on the effects of light on plants constantly yields new information. The commercial light industry converts these discoveries as quickly as possible into marketable products; consequently, books with technical information are often quickly outmoded. Be sure to check the date your reference book was published. This recommendation by no means precludes using these older books; they include a great deal of valuable cultural information.

Elaine Cherry's *Fluorescent Light Gardening* is just such a book and a good many gardeners consider it "the Bible" of light gardening even after 10 years. In it the enthusiastic author gently bridges the gap between technical equipment and the desired result in plant material. Her book is not only full of imaginative ideas on how and where to construct light gardens, but also contains one of the best sections on plant culture under lights to be found anywhere. Her cheerful and humble running description of her own trials and errors both forewarn and reassure the new gardener.

Of course, at some point we must

books and the green world

come to grips with the scientific side of gardening with light. If you are the sort of person who is not satisfied with reading the basics, setting it up and letting it go at that, Frederick and Jacqueline Kranz's *Gardening Indoors Under Lights* will broaden the horizon. After some historical background, the Kranzes clearly explain the technical aspects of light gardening and the jargon involved in describing quantity and quality of light. Having given the theory, they describe the phytotron, a completely controlled environment including temperature, atmosphere and light in which to grow plants. They outline detailed plans for the construction of an indoor greenhouse as well as ideas for illuminating outdoor areas. The Kranzes discuss propagation of both house plants and hardy plant material under lights at great length.

The light fixtures used in indoor gardening have always been an eyesore when brought into living areas. However, Elvin McDonald's *The Complete Book of Gardening Under Lights* offers inspiring photographs of some very attractive indoor gardens. The book lacks a little in general cultural and technical information but more than makes up for that in the chapters devoted to the culture of specific plant families under light.

Following along in interior decoration, Jack Kramer in *Plants Under Lights* has some striking ideas for free-standing planters and wall unit gardens using both fluorescent and incandescent lights.

George Elbert, past president of the Indoor Light Gardening Society of America, has produced one of the most recent books on the subject: *The Indoor Light Gardening Book*. Elbert explains in detail the technical aspects of light gardening as well as the different products available. He not only describes the commercially available tubes, bulbs, and fixtures but gives good basic information on how they work and their effects on plants.

The book is well illustrated and contains photographs of the commercially available units ranging from the 24-in. table top unit to the multi-shelved 4-ft. equipment. But beyond the ready-made, Elbert shows what amateur light gardeners have constructed on their own and it stimulates one's imagination to see a fixture under a kitchen counter or a vast floor garden illuminated by valanced fixtures suspended from the walls. There is even a light garden room, an indoor garden created by lining the ceiling with fluorescent fixtures hidden behind special louvering.

Light gardening truly comes of age in Elbert's book; it moves out of the basement into living areas and he is not content to stop there. He addresses himself fully to the subject of plants that really bloom under lights. He includes lists of specific varieties of begonias, gesneriads, orchids and other plant families that will flourish and bloom in the light garden environment. Vital data is provided for each plant family as to light intensity, day length, soil mix and fertilizing procedures.

Elbert has written a charming section on how to set up a culinary herb garden and has listed suitable herbal material to try under lights. In another section he tells how to set up a child's light garden, complete with a list of plant material selected for its appeal to the young gardener along with a little advice in teaching horticultural responsibility to the young.

The book concludes by referring the reader to where to buy the plants and lighting equipment described, names of several plant societies that have worked with light gardening and some sample prices for various fluorescent lamps.

Lighting for Plant Growth by Bickford and Dunn is probably one of the best technical books around. The authors present the theories and information essential to understand the photoresponses of plants and how to intelligently generate, control and measure the light energy required to produce these responses. The book can be understood by any intelligent gardener, but will be especially interesting to the advanced light gardener. It includes a number of European research papers never published in this country.

With so much to choose from why not take advantage of these late summer days to plan for those long winter nights. Do a little reading about light gardens and create a better place for your house plants. Don't give in to total winter this year.

books

The Complete Book of Gardening Under Lights
by Elvin McDonald
Doubleday & Co., New York, 1965

An Easy Guide to Artificial Light-gardening for Pleasure and Profit
by Vernon Johnson and Winifred Carriere
Hearthside Press, 1964

Fluorescent Light Gardening
by Elaine C. Cherry
Van Nostrand Co., New York, 1965

Gardening Indoors Under Lights
by Frederick H. and Jacqueline L. Kranz
The Viking Press, New York, 1957

Growing Plants Under Artificial Light
by Peggy Schulz
M. Barrows & Co., New York, 1955

The Indoor Light Gardening Book
by George A. Elbert
Crown Publishing, Inc., New York, 1973

Lighting for Plant Growth
Elwood Bickford and Stuart Dunn
State University Press, 1972

Plants Under Lights
by Jack Kramer
Simon and Schuster, New York, 1974

other publications

Gardening Under Artificial Light
Brooklyn Botanic Garden
Brooklyn Botanic Garden, New York

Light Garden, The Magazine for Artificial Light Gardeners
Indoor Light Gardening Society of America



William S. Patten received a B.S. from Dartmouth; his major was economics. He studied at the Barnes Arboretum for three years and attended short courses at Longwood in landscape design. Patten is treasurer for the Delaware Valley Chapter, American Rock Garden Society. He lives in Downingtown.



Nancy Kolb won the 1975 Horticultural Sweepstakes at the Philadelphia Flower & Garden Show. She is vice-chairwoman for the horticulture classes for the '76 & '77 Shows. Ms. Kolb is horticultural chairwoman of the Huntingdon Valley Garden Club. At present she is writing a column for the *Bucks County Panorama.*

ANSWERS TO QUIZ

1. Catkin
2. Epiphytes
3. Iron
4. Acer
5. *Liliaceae*
6. True
7. Cordon
8. Dioecious
9. Hip
10. Systemic
11. *Magnolia stellata*
12. Two
13. May
14. One or Two
15. Russian olive
16. Six to Eight
17. Photosynthesis
18. Blanching
19. Shaded
20. Dawn redwood
21. Corm
22. November
23. Clone
24. Light
25. Dutch elm

Drawing: Highbush Cranberry

daphne genkwa

Among the early blooming plants in the Delaware Valley area is the intriguing *Daphne genkwa* of the Thymelaeaceae family. *D. genkwa* grows about 2 to 3 ft. tall. Against the white wall background of our house its delightful lavender blue flowers appear before the leaves and has the effect of a spray of delicate florescences that seem almost artificial. Even in winter this deciduous bush is most attractive with its bending branches suggestive of a Japanese design.

This unusual shrub, a native of Japan, has a fragrance that is most enjoyable and is a noticeable attraction to visitors in our garden. The plant is worthy of the extra effort and care necessary for its survival and should give years of pleasure to those who try it.

It is propagated mostly by root cuttings in sand in early spring, though layering and grafting may be used with some success. Removing the plants from the pots and planting them outside in the fall promises early bloom, perhaps in late February or early March. Don't be discouraged if you don't have blooms the first year; you will the next. The soil can be neutral or a little on the limy side with a pH of 6-8. Avoid dryness. It does not do well in wind; sunshine is most desirable. In eastern United States its hardiness is classified as Zone 6 and I have seen it growing splendidly in eastern Connecticut.

The selection of a site for planting should be its permanent location as it does not like root disturbance once established. This is only one of the many fragrant daphnes that are available in the Delaware Valley. Check with the PHS Library for nurseries that may have them.

William S. Patten

azalea 'fielder's white'

I am sure that every horticulturist has a favorite individual specimen plant that somehow gives the grower more pleasure and satisfaction than the other plants in his collection. In my case Azalea 'Fielder's White' has certainly become one of my particular joys.

We acquired the azalea at The Great Auk (an auction and sale at the Academy of Natural Sciences) five years ago. In truth, it came to us already trained into its present shape of three graduated tiers. What a thrill it was when the first year we owned it, we were able to force it into near perfect bloom for the Philadelphia Flower and Garden Show where it won the Edith Wilder Scott award for the best exhibit of the week in the horticultural classes.

Culturally, it is less difficult to maintain than you might imagine. As soon as it has finished blooming, I prune it drastically trying to keep the graduated effect of the tiers and to keep each layer flat across the top. By the first of May, it goes outside in full sun to spend the summer providing an interesting focal point in the garden even though it is not in bloom. It is necessary to continue periodic pruning to preserve the desired shape. During the summer it also requires plenty of water and monthly feedings with an acid fertilizer.

To bloom properly an azalea needs a cold dormant period, so when fall arrives, we move it (it takes two strong people and a hand truck) into an unheated shed. Here we water it no more than once a week. This treatment generally causes it to dop at least one-half of its leaves; and believe me, the first winter I was sure that I had killed it. However, six weeks before we want it to bloom, we move it first to a cool (above freezing) garage and finally into a 58° greenhouse. With luck and warm sunny days it will burst into full bloom six weeks later. Timing is still largely a matter of luck, for there have been years when it has opened too soon or too late for the Show.

Transporting the plant to the Civic Center from Doylestown is no small project. My husband Roy decided that laying the pot on its side, anchored in a flat, and suspending the top of the plant from the roof of the van is the best system. Trial and error has proven him to be right.

We estimate this plant is now approximately 20 to 25 years old. We hope we can maintain it in as good condition as it is now for the next 20 years.

Nancy Kolb

helianthus tuberosus

If ever any vegetable has been tagged with a misnomer, it's the Jerusalem artichoke. It neither originated in Jerusalem, nor is related to the globe artichoke. More correctly, it grew wild in the United States and was a main source of food for the Indians. Sometime later it was adopted, crossbred and cultivated in Europe, and eventually named ginasole by the Italians (translated: turning to the sun).

A cousin to the sunflower, it grows from 6 to 12 ft. tall, produces lovely flowering heads, and can run rampant if not kept in check.

The edible, crunchy roots have a delightful, nutty flavor reminiscent in taste and appearance of water chestnuts.

The potassium and thiamine packed tubers or roots contain no starch, few calories, and can be boiled, baked, fried, escalloped, steamed, pickled, or served raw in salads.

Plant the tubers preferably in the spring in almost any type of soil that receives some sun. Select a site where their growth will not interfere with other plants either by shading or by strangling.

Their planting culture is similar to potatoes; the tuber eyes should be placed a foot apart, about 4 in. deep in rows separated by 2 ft.

In the fall, and throughout the winter, dig and remove the edible roots only as needed because of their perishability. Cover those that are to remain in the ground all winter with a heavy mulch to protect them from freezing.

In the spring, you'll discover an incredible amount of tubers that should be eaten, transplanted or discarded.

Jan Riemer



Jan Riemer began gardening over a decade ago, and converted to the organic theory a few years later. She writes a syndicated garden column, and has recently authord *The Beginner's Kitchen Garden* published by Wm. Morrow and Company.

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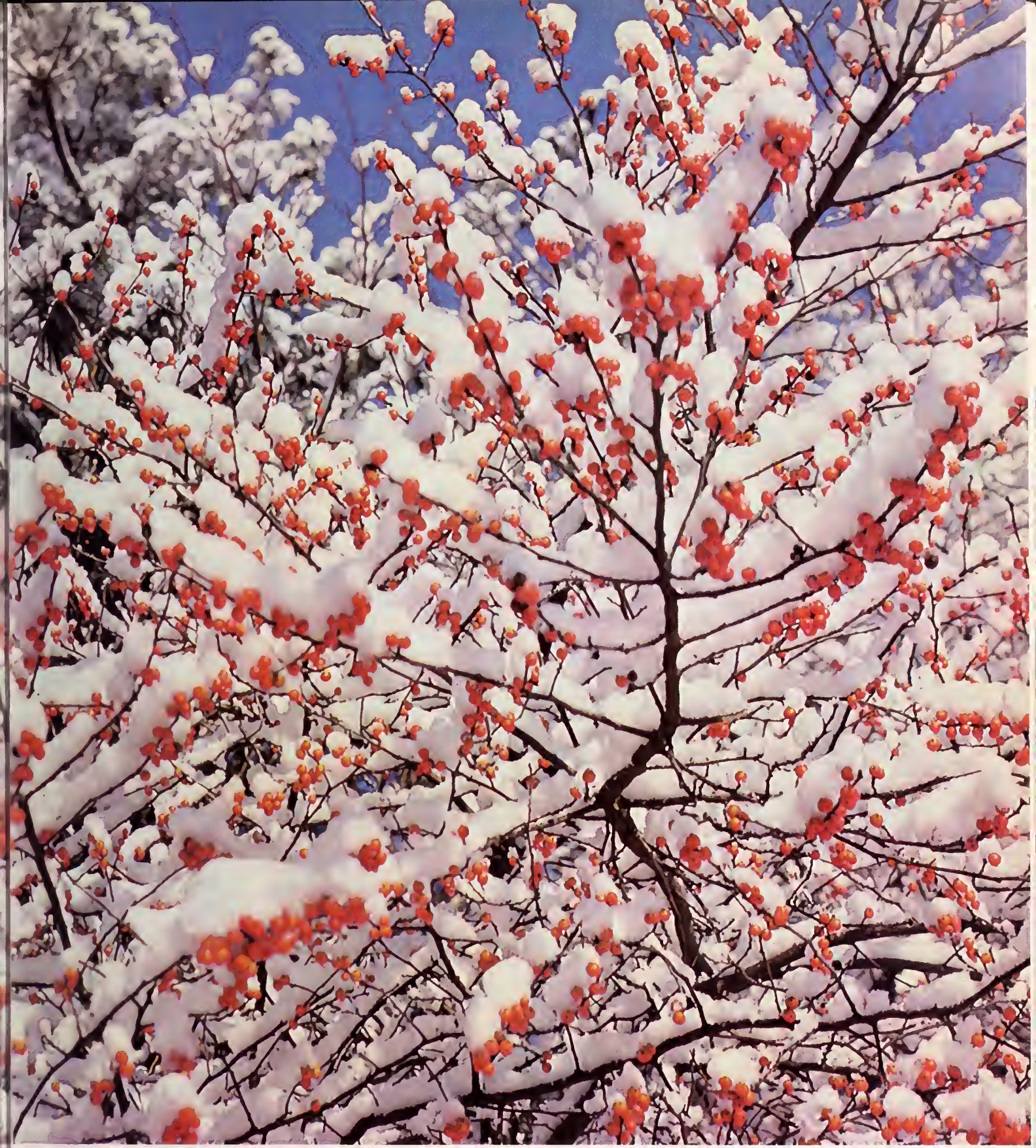
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Color: More Than Meets the Eye
See page 4



The Many Faces of Holly

See story on page 7.

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Front cover photo by Pamela Herring
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Henry M. Cathey is chief of the Ornamental Laboratory, USDA, Agricultural Research Center in Beltsville, Maryland. He is also president of the American Horticultural Society.



guest editorial

legal disclosure of the needs of the living landscape

If certain individuals and groups have their way, all container plants sold in this country will legally be required to bear a label explaining the environmental requirements and needs for optimum growth and development.

This could cause a bit of controversy if you assemble more than one gardener in the room and begin discussing the care, feeding and sunlight requirements of any species of plant. You'll soon find an argument in the brewing. Even the environmental requirements of a simple plant like a coleus may start a raging controversy. Although most gardeners will agree that filtered sun is best, very few individuals can come to an agreement about the proper fertilizer and moisture levels for these relatively hardy plants.

Check any gardening book to examine our current state of knowledge. Read and compare the suggested frequency of the watering of a Norfolk Island pine or a Boston fern. Now check another source. You will note that one suggests that you water almost daily; others encourage you to train the plant and water it only once a week. Now, mix and stir these views with other monographs written by noted garden authorities, you will find hundreds of opinions on syringing, the proper fertilizer, the correct sun exposure, the best way to control insects, proper pruning methods, propagation techniques . . . etc. The opinions are endless and oddly enough, to a degree, may be correct.

If we draw a conclusion from all these noted authorities, we discover that plants are extremely tolerant of a wide range of abuse from the cultural procedures to which we subject them . . . plants adjust their growth characteristics and survive often under the most difficult conditions. Yet many plants will die abruptly if too much abuse is given them. Others just slowly "do the strip" — as one leaf after another just falls from the plant.

Most gardeners take their failures in stride. They simply try again . . . and again . . . and again, often reading every monograph they can find on the subject. Eventually they profit from their previous mistakes of not enough light, moisture or nutrients. Eternal optimism rules the mind of the good gardener.

Eventually it may conclude that the plant he fought so hard to save was already infected with an incurable disease or that the plant is simply not environmentally adapted to his region.

"such tags would have as much usefulness to the American public as a pair of socks on a rooster."

This is what horticulture is all about. It has been that way from the very beginning. Gardeners seek out a particular plant and try to master the cultural procedures to insure that it will survive in a new and often hostile location. They select only healthy and vigorous plants and try to propagate them in an environment that will insure their successful development. A good gardener won't buy inferior products. He uses his eyes and his knowledge to determine if a plant is really worth the price.

New plant people often buy what appeals to them, without knowing if it will succeed . . . without knowing if the plant is really healthy and vigorous. In this age of mass consumerism, many novice gardeners are beginning to ask if all the seeds and plants that are on the market are really what they are reported to be.

A recent study by the Federal Trade Commission suggests that 40% of the 2 billion dollars worth of plants sold by nurseries, die before the first year is out. They suggested a solution to this staggering mortality rate may be the attaching of a care and feeding label to every plant. (The FTC, sometime ago, required the clothing industry to sew care tags in garments.)

On the other hand, one of the three FTC Commissioners noted that "such tags would have as much usefulness to the American public as a pair of socks on a rooster." Labelling just may not be the answer.

I believe that most people would agree that proper labeling, identifying the correct Latin and common name would be a help in the education of all gardeners. But how much correct information regarding the proper environmental requirements can be attached to a 59¢ cutting of *H. helix* 'Jubilee'? Who would be the ultimate authority to supply this information? Plants don't need a legal disclosure of their wants attached to them. Conditions where they eventually may be planted are too diverse to justify printed instructions. What plants do need are more knowledgeable gardeners. The responsibility for providing this knowledge lies within our gardening books, periodicals, such as the *American Horticulturist,* our garden shows, and other educational programs.

We must also communicate that ultimately all plants must be replaced. No living thing is designed to be around forever. One tightly worded label for each species will never meet the gardening information needed to cope with planting problems in any specific community.

by Henry M. Cathey

Editor's note: You can express your views through Ms. Mary Rae Bruns, Consumer Protection Specialist, Federal Trade Commission, 28th Fl., Federal Building, 915 Second Ave., Seattle, Washington 98174.

Reprinted with permission from *American Horticulturist,* Summer '75.



Snow scene on small balcony. Plants include: crab apple tree (left), rhododendron (center right), *Pieris japonica* (upper right).

The Changing Seasons
seen from the nineteenth floor

by Linda Yang

Linda Yang is a graduate of the architectural school of the University of Pennsylvania. Although associated with her husband's architectural firm, she presently devotes more of her time to their two children, writing and gardening, admittedly "not necessarily in that order."

She writes from first-hand experiences with her own city terraces and is the author of the recently published Doubleday book, *The Terrace Gardener's Handbook; Raising Plants on a Balcony, Terrace Rooftop, Penthouse or Patio.*

photos by Linda Yang

City gardeners are not immune to the meaning of the seasons' changes. In spite of their distance from the earth, they also know that you have to begin in the fall to prepare for the winter and spring. They, too, often have a keen eye for the changing look of plants, and a sensitivity to the need for year-round care and feeding of these plants if they are always to look their best.

It's too cool now for alfresco dining, but a balcony, terrace, penthouse or patio should continue to provide beauty and joy, if only through a window. And now is a good time to look for trees, shrubs and vines that add special interest in the fall as well as into winter. These plants, when grown in containers, may not achieve the magnificence of their country counsins, but they do put on an admirable show.

Among the autumn favorites I've seen thriving on balconies and rooftops are the firethorn shrub *(Pyracantha coccinea)* and the American mountain ash tree *(Sorbus americana).* Both of these are lush with colorful fall berries, which develop from early summer flowers. The leaves of the mountain ash turn orange before dropping, while the firethorn retains its green leaves all winter in this area.

For autumn leaf color few plants rival the dogwoods. The American dogwood is a bit wide for many city terraces but the Japanese dogwood *(Cornus kousa)* has an upright form and is

continued



Snow scene with birds resting on sourwood tree branches. Other plants include: *Pieris japonica* (lower right), mountain ash (upper right), weeping elm (left), climber roses (left).

comfortable in any small corner. Here again, early summer flowers become glorious fall berries.

On my own terrace on the 19th floor, I admit to favoring my sourwood or sorrel tree *(Oxydendrum arboreum).* Although last to leaf out in spring (usually I'm sure it's died), the sourwood makes up for its tardy habit with vividly colored scarlet fall foliage. When these leaves finally yield to winter winds, the tree remains bedecked with graceful drooping white seed pods, the remains of its summer flowers.

Even if they didn't yield pints of marvelous fruit, I'd still be partial, too, to my highbush blueberry shrubs *(Vaccinium corymbosum).* When their crimson and orange autumn leaves fall, a fantasy of jagged branches remains to be silhouetted against the snow or traced with ice. And, of course, the flowers of late marigolds and chrysanthemums are set off well against the red autumn leaves of Boston ivy *(Parthenocissus tricuspidata)* and Virginia creeper *(Parthenocissus quinquefolia).* These are two excellent vines that come in handy for a multitude of terrace problem spots.

Few city folk, unlike farmers or other seasoned gardeners, realize that "spring begins in autumn." They enjoy the falling leaves, but too often forget that plants are going to sleep, not dying. These dormant plants will continue to need small quantities of both nutrients and water all winter long. Autumn, then, is the time to prepare for a healthy spring awakening.

I start my winter care program first by pulling out the dead or dying summer flowers. That is a depressing scene at any time of the year, but it's also an easy way to loosen the soil, which now has become compacted. Using a trowel (or very large kitchen spoon) continue to turn the soil lightly and don't worry about breaking a few roots here and there. Shocking as it may seem, this modified amount of "root pruning" is really beneficial for spatially restricted container trees and shrubs.

Since winter and the dormant period are coming, it's important not to encourage new plant growth, so the



Snow scene with summer chairs. Plants include: crab apple tree (left), willow tree (center), yew shrubs.



Removing a bagworm case in early fall.

nutrients that you add at this time must be slow-acting ones. If you can get well-rotted compost or leaf mold (sometimes available from a country friend) work it into the soil. If not, it's possible to buy dehydrated cow manure at a garden center; use that instead. As you turn the soil, add in a generous handful for every 2 ft. or so of plant height. Along with this, I also add a similar amount of blood meal or cottonseed meal, good sources of nitrogen. If the soil has lost its friability (few plants are happy in "concrete"), I mix in some perlite and peat moss as well. If you run out of room in the tub, remove some of the old soil. The spent matter need not be thrown away if you've room to store (and then *re-store*) it.

Special attention now should be given to the spring and early-summer flowering shrubs and trees. For the deciduous ones, work in a handful of bonemeal for every 4 ft. or so of height. Then treat your flowering broad-leaved evergreens to half this amount. If you can't get bonemeal, substitute one of the ground rock phosphates which also supplies the phosphorus so vital for flowering.

Once the summer plants are out of the tubs and the soil is loosened, it's time to plant spring flowering bulbs. Although many city folk are familiar only with the most common, tulips and crocuses, it's fun to plant some of the lesser known species such as grape hyacinths (muscari), Siberian squill *(Scilla sibirica)* or glory-of-the snow (chionodoxa).

The final touch is added to the autumn terrace with a broom and a dustpan. They are the best means I know of for getting rid of fallen leaves that collect behind and between the planters and in the floor drains. Sweeping up this debris is not so much to tidy up as to get rid of some of next year's problems in advance. These leaves provide a cozy haven for an

continued



City bird resting near feeder, seen from inside through crab apple branches.

array of insect eggs and disease organisms whose presence is less than welcome in any garden. Before the freezing weather comes, I also use a dormant spray on those plants that have had particular problems with disease or pests. Since dormant sprays contain petroleum oils, they are used only on the deciduous trees, shrubs and vines that have already lost their leaves. It's possible also to pick off any egg masses, cocoons, bagworms, and the like, all of which can be easily seen now. (You can donate these items to a school for "nature study," and they'll never suspect the true reason for your generosity.)

It's time now, too, to install or restock the bird feeders. Both the passing migrants as well as local winter residents will gratefully stop at even the tiniest of balconies. I find these cheerful visitors a welcome sight, especially in mid-winter.

No, I do NOT bother with anti-dessicants or burlap or wind screens or any other such devices or eyesores for "protecting" plants for the winter. Instead, I use *only* locally hardy plants which have had the summer to make themselves completely at home on my terrace.

Some time around Thanksgiving, it's nice to cover the tops of all the tubs with an assortment of evergreen boughs, berry branches and white twigs. Not only are these decorative, but they're useful as a winter mulch, helping to stabilize the temperature and conserve moisture in the soil.

Finally it's possible to sit back and enjoy the terrace from a comfortable chair in a warm room, secure in the knowledge that you're ready for spring, at last.

●



Snow outlines of terrace trees and shrubs.



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1. Holly flowers, female (left with dark pistil) and male (right)
2. *Ilex rotunda* close-up
3. *Ilex opaca xanthocarpa* (yellow berried ilex)
4. Society Hill - Use of *Ilex cornuta* in entrance planter

photos by
Frutchey Associates
Phyllis L. Herring
Swarthmore Foundation
Scott Foundation



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by Phyllis L. Herring

Phyllis Herring is a landscape designer. She received her training at Temple University, Ambler Campus School of Horticulture. Her designs have been for private residences, many at the shore and have ranged from condominiums to redesigning old formal gardens. One of the latter has included a specimen gold garden inspired by Gertrude Jekyll at Pyrford Court in England.

THE MANY FACES OF HOLLY

For the holly enthusiast in the Delaware Valley
Plants to consider and people to see

As a designer, I long ago fell in love with holly. Whereas a proposed perennial combination may backfire from seasonal peculiarities, a garden will never be without excitement and variety if the design emanates from a well-thought-out evergreen structure. These are the bare bones that are with us 12 months of the year —long after the petunias fizzle and the chrysanthemums collapse.

To this end, the genus *Ilex* has few rivals to provide variety of shape and diversity of texture and color, whether allowed to grow naturally or intricately pruned by gardeners. One can easily become addicted to using it everywhere, for some variety is almost always suitable to a given place in this area. We have a legacy of

continued



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5. Society Hill - American holly hedge
6. *Ilex cornuta rotunda* as hedge
7. Society Hill entrance - *Ilex crenata*

some 450 species and great excitement lies in the wealth of hollies not yet introduced from all parts of the world.

A thriving holly is hard to equal in any garden and keeping it thriving is a relatively uncomplicated process. Requiring minimum care throughout the growing season, the holly gives us most pleasure as the days grow short and cold, its evergreen foliage remaining robust and luxurious while colored berries begin to lend warmth to a doleful landscape.

Holly is particularly adaptable to city conditions where one might not expect such an elegant ornamental to flourish. The Air Pollution Laboratory at the U.S.D.A. Research Center has stated that hollies are among the species most resistant to pollutants. Those things that threaten life in urban areas, dirt and soot, carbon monoxide and sulphur dioxides, intense heat and funneled winds—all seem to affect holly least. Experts have also noticed that leaf minor, a major holly problem, seems to be controlled by pollutants. The versatility of this evergreen for the colorless city landscape has scarcely been explored.

People also seem unaware that holly thrives at the seashore. It tolerates salt spray, sandy soil, and buffeting winds where many other plants succumb. Native hollies are often found in such habitats.

Since the choice of species and cultivars is so overwhelming, I have attempted to describe here only a few favorites that may be unfamiliar to home gardeners.

some natives for our use

As interest in holly grows, the natives (about 25) should become very important. Born here, they have a better than average chance to succeed here. Since the majority are native to our southland (some with such evocative names as *Ilex vomitoria, I. myrtifolia; I. amelanchier* and *I. ambigua*), extensive testing remains to be done for hardiness in our area. There are encouraging signs that many of these will survive.

King of the natives is *I. opaca,* the American holly. No two specimens of this evergreen tree are ever exactly alike and most nurserymen offer merely an unnamed *Ilex opaca.* Among these is the unique *I. opaca xanthocarpa* with brilliant yellow berries—an absolute knockout in midwinter.

Mention might be made at this point of holly for hedging. The female American varieties 'Hedgeholly' and 'Clark' are two in particular that are dense in habit and withstand shearing well. Of a holly hedge you might say "how extravagant!" Even author-gardener, V. Sackville-West rued this fact as she regretted the prevalent use of yews over hollies as hedging material in her day. Surprisingly enough, as I compared nursery prices in a 2-3 ft. size, the wholesale price of a berried *I. opaca* was about 50¢ under that same size varieties of taxus (yew). And what superior hedges the hollies make, whether left to grow naturally or sheared.*

Another useful native, *I. glabra,* is a fine textured slow grower whose delicate leaf many would not recognize as holly at all. Easily pruned and shaped,

*American holly is by no means the only species to be used for hedging; there is an infinite variety in the range between this larger form and the lower edging cv. of *Ilex crenata*, the Japanese holly.



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8. *Ilex opaca* 'Golden Fleece'
9. Field showing upright habit of ilex
10. *Ilex pedunculosa*

its superior tolerance to shady situations answers a dire need in many gardens. Fruit is insignificant and is the berry from which the Indians made ink. Generally black, there is a white-fruited form, leucocarpa, that is of considerable interest.

Particularly appealing are two native deciduous hollies which have been proven hardy here, *I. verticillata* (winterberry or black alder) and *I. decidua* (Possum Haw). Either of these can be a wondrous sight in a winter swamp. For landscape use, I favor the decidua because, after the leaves have fallen, its larger berries persist far longer and are not blackened by the frost as are those of the verticillata. Both are found in low and swampy areas but adapt to most garden situations, transplant easily and are attractive to the birds. Fruits are generally bright red although yellows have been found in both species providing an interesting winter pallette, especially striking against the winter snow. One client, however, misunderstood the deciduous character of the plant and wrote to me in anguish that "the lovely holly you planted in the spring has now bitten the dust."

foreign introductions — a few favorites

Hollies are found in most parts of the world, in such diverse places as South America and China, France and Japan. Among foreign introductions the choice for landscape use is staggering and promises to become even more so in the years to come. Gene Eisenbeiss, Research Horticulturist for the U.S.D.A. at the U.S. National Arboretum in Washington says there are hundreds of known species in the tropics that have yet to be introduced into cultivation and that for the temperate climate there are still hardy hollies to be found in China that we have not seen in the western world.

Picture a graceful evergreen pear tree, with leaves like laurel and fruits like cherry, and you will have the image of *I. pedunculosa,* an attractive native of China and Japan. Especially useful when grown as a standard tree, it has a semi-spreading character that lends an overhead plane that few evergreens do in this climate.

The cultivars of *I. aquifolium,* commonly called English holly, did not actually originate in England alone but in other parts of Europe, North Africa and Western Asia. England, however, has done more work with this holly than has any other country. Generally, the English holly is a moderate sized shrub-to-tree form shaped much like our American holly. Its leaf tends to be the shinier and more lustrous of the two. *I. aquifolium* has been grown for centuries and is the holly of ancient lore—dating back before the Romans in the time of the Druids in ancient Britain and Gaul. Generally believed to be less hardy here than *I. opaca,* many cultivars may prove to be more hardy than formerly supposed. On the other hand, certain tentative plants that have survived may have done so because of the mild character of our recent winters.

I. aquifolium is the most variable member of the genus and the cultivar Angustifolia can be used as an example

continued



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11/12 Moving hollies onto Swarthmore College Campus, August '75

13 Holly Walk. Mr. Frorer's collection in Wilmington before it was moved to the Swarthmore College Campus.

of a choice specimen for our area. Growing into a lovely narrow pyramid, it has beautiful shining lanceolate leaves, bears a great profusion of berries and is most satisfying when an upright plant is called for in a plan.

The species of holly we have discussed is but a tiny sampling of a generous genus. The Pennsylvania, New Jersey, Delaware and Maryland area is rich in references for the holly enthusiast to augment his or her knowledge. Within a few miles are the extensive collections at Tyler Arboretum,* Morris Arboretum, Swarthmore College (Arthur Hoyt Scott Foundation),* the Barnes Foundation* and Rutgers University** as well as one of the more unique holly businesses in all the world.

arthur hoyt scott foundation

One of the more intriguing local holly tales is that of the Frorer collection and how it was moved last summer in its entirety to the Scott Foundation on the proud campus of Swarthmore College. James R. Frorer, an alumnus and avid collector near Wilmington, had traveled around the world to gather species of the genus ilex. When he gave the collection, with an allowance to transfer it to the college grounds, a wonderful opportunity arose for the public to observe the habits of many species and cultivars, many of which were not believed to be hardy in our zone, e.g., *I. cassine* and *I. vomitoria,* native species of the south.

On a campus that was already a horticultural paradise, the addition of a collection of such breadth was exciting and much consideration was given to the ideal new location. Harry Foulke, the grounds foreman, spent many early morning hours in the proposed area, finally proving to his satisfaction that sufficient draft exists to dispel any pockets of frost. Recommended exposure is usually away from the south as protection from winter sun and drastic winter temperature change. But ultimate survival depended even more upon the availability of water; so the decision was made to plant in the dell, a little removed from main campus activity, on a southern slope where the Crum Creek provides a ready water supply at all times. Water was no small consideration; the water requirements of some 434 newly moved specimens were to be considered.

Fortunately, the rainfall has been ample and the winter mild; the experts are watching the collection with care, noting the apparently successful adaptation of such precious specimens as *I. latifolia* and *I. Chinensis.* The college is justly proud of obtaining and moving those specimens of up to 20 ft. They have tucked these delicate varieties, as well as the more tender variegated ones, under existing trees for protection. They attribute some of their success to the fact that Frorer made it a practice to collect or buy only small plants.*

Members of the Scott Foundation, and Longwood Gardens as well, are busily propagating the collection to insure against the loss of any one variety should the parent plant succumb. In the greenhouse are five or six cuttings from each specimen, to be planted out in the nursery at a future date. Only one plant, *I. integra,* a large fruited

*Official holly arboretum.
**Official experimental holly test center.

*Frorer has, by the way, begun to establish a new collection, already numbering 120 hollies.



14 Harvesting holly in Millville, New Jersey

ornamental from Japan, was lost before cuttings could be made. It is worth noting that the Foundation felt that an overall loss of 10% or 40 plants might be expected from the move. To date they have lost only 6% and we must hope that the expected loss level will not be met during the next two critical years.

american holly products

American Holly Products flourishes in Millville, N.J., to the point where it is a challenge to keep pace with the demand for their products. Dan Fenton, president of the nursery, tells the story of progress better than anyone else:

> "Clarence Wolf started the New Jersey Silica Sand Company. He was a very religious man, didn't believe in giving whiskey or cigars at Christmas. So when one of the sand company employees appeared with holly in a pick-up truck, Mr. Wolf asked, 'Where did you get the holly?'
>
> 'Out in the woods.'
>
> 'Can you get any more?'
>
> 'All you want.'
>
> That year, 1926, we put gifts of holly into 42 lettuce crates and sent it to the offices of United States Steel and to our other customers. What Mr. Wolf started, he could not stop. The next year, customers called to ask if they were going to get holly at Christmas, and the 42 crates increased to 80."

Eventually the holly project was sold as a business separate from Silica Sand. They became American Holly Products and now ship 100,000 pounds of cut Jolly Holly all over the country at Christmas time.

An unusual holly museum operates in conjunction with the nursery. The qualities of holly wood inspire craftsmen, and many hand-carved items are on display along with many priceless treasures decorated with a holly motif.

old hollies

Here in the Middle Atlantic region are some outstanding old hollies that you may want to visit:

1. Indian Steps, Pennsylvania, at Power & Light Company. 280 years old - 60 ft.
2. Garden State Parkway - 4 miles south of Ocean City - 300 yards from the exit. Picnic rest area has been created at point where north and south lanes have allowed the tree to stand. About 300 years old.
3. B & O Holly, Northeast, Maryland. Approximately 265 years old.

To plant holly is to plant permanence. In contrast to the transitory life of the birch or willow, a holly plantation increases in beauty and in value year by year. As with few other commodities of our age, the holly branch has been beloved for centuries and promises never to lose its appeal. As a native or exotic, deciduous or evergreen, tree, shrub, bonsai or topiary, in sun, shade, shore and city, holly could easily be the most widely planted genus in the world. And it will satisfy almost every gardening need in the Delaware Valley.

●

that male — female thing

To insure pollination and consequently fruiting, male hollies must be planted along with the females. Males have been known to pollinate from a greater distance than ¼ mile, but Dan Fenton, expert at Millville, feels that this is the safest distance in which to plant a male, and to do so in the ratio of one to ten females. Other conditions met, this will insure pollination.

publications

Although there are some excellent older books on the subject of holly, the following are the most up-to-date sources:

Handbook of Hollies, The National Horticultural Magazine, Fall 1970

Growing American Holly in New Jersey, Extension Bulletin 388-A, Co-operative Extension Service, Cook College, Rutgers University, New Brunswick, New Jersey

Practical Suggestions for Growing Holly, Daniel G. Fenton, Uptown Press, Millville, New Jersey

AMERICAN HOLLY SOCIETY, 407 Fountain Green Road, Bel Air, Md. 21014

Highly recommended for those gardeners intrigued by holly. Nominal dues bring current information about *everything* connected with holly.

FAVORITE HOLLIES AMONG HOLLY EXPERTS

John M. Fogg, Jr., Director
The Arboretum of the Barnes Foundation
Merion Station, Pa.

Species
Ilex ciliospinosa
Ilex pedunculosa - if asked to pick only one
Ilex pernyi - excellent but tendency to be sparse

(deciduous)
Ilex serrata
Ilex decidua
Ilex geniculata - very tiny fruit on long peduncle; natives not readily available
Ilex collina - beautiful fruit; natives not readily available

Hybrids
'East Palatka'
'Camelliaefolia'
'San José' - takes pollen from any other species; two in the trade
Ilex cornuta cv. Burfordi - can be pollinated from any other species

Dan Fenton, President
American Holly Products
Millville, New Jersey

Ilex opaca		Hybrids
'Menantico' (f)	'Farage' (f)	'Nellie Stevens'
'Maurice River' (f)	'Arden' (f)	'San José'
'Jersey Knight' (m)	'Lady Alice' (f)	'Lydia Morris'
'Silica King' (m)		'Dr. Kassab'

For Bonsai:
Ilex crenata 'Dwarf Pagoda' (f) *Ilex crenata* 'Green Dragon' (m)

Russell M. Bettes
Assistant Professor of Ornamental Horticulture
Ambler Campus of Temple University

Ilex aquifolium
We can grow some in the Philadelphia area. Although not as hardy, there are the advantages of glossy leaf, spiny character and fruiting on one-year-old wood.

Ilex opaca
'Wyetta'
'Arden' - one of best shows; very hardy although a little hard to transplant
'Old Heavyberry' - large fruit, free fruiting
'Cardinal'
'Hedgeholly'
'Farage' - very persistent fruit
'Croonenberg' - large, heavy fruit

For landscape use American Holly might have its drawbacks and is probably why it is not used more. It takes a number of years to reestablish roots and get good growth after moving. Trimming necessary to keep compact. At Ambler we prune for the fruit before fall in order to let it show.

Ilex cornuta cv. Burfordi is still good and readily available, but the hybrid 'Nellie Stevens' is even better because of its foliage, prickliness and high gloss. Both heavy fruiters.

Ilex pernyi - because of small leaf and narrow form which remains small in comparison to others.

Ilex aquipernyi - for same reasons

Ilex crenata
cv. Green Cushion
cv. Wayne
cv. Green Island - although faster grower and spreader

Mr. Bettes feels that the smaller forms of holly are becoming more and more important for present day home grounds and smaller landscapes. For this reason he favors the crenatas and the upright growers.

Owen B. Schmidt, Landscape Architect
Coatesville, Pennsylvania

Ilex opaca - the greatest for our use
'Old Heavyberry' 'Maurice River' 'Grace'

Ilex crenata
'Compacata' - even though it does get large
'Glass' - tough, goes to 6' - 8'
'Helleri' - so far the best
'George Hart' - worth developing; won't get out of bounds
'Red Lion' - worth developing; won't get out of bounds

Hybrids	Species	
'Fosteri'	*Ilex pedunculosa*	*Ilex pernyi*
'Altaclarensis'	*Ilex ciliospinosa*	

Joseph Oppe, Director
Arthur Hoyt Scott Foundation
Swarthmore College
Swarthmore, Pennsylvania

More consideration should be given to taxa other than *Ilex opaca.* People in the greater Philadelphia area should be growing more of the English, Chinese, and hybrid types. A word of caution, I would suggest staying away from the variegated types of English holly as most seem to be, at the best, marginally hardy.

Some of my favorites are:
Ilex x altaclarensis cv. Camelliaefolia
Ilex x altaclarensis cv. Nigrescens
Ilex aquifolium cv. Angustifolia
Ilex aquifolium cv. W. J. Bean
Ilex cornuta cv. Burfordii
Ilex cornuta cv. D'Or
Ilex x Doctor Kassab
Ilex x meserveae cv. Goliath
Ilex x meserveae cv. Blue Boy (male for 'Goliath')
Ilex x koehneana cv. Chieftain
Ilex x koehneana cv. San José
Ilex opaca cv. Miss Helen
Ilex opaca cv. Boyce Thompson Xanthocarpa

Herbs in Winter

by Barbara Bruno

Barbara Bruno has appeared in these pages before. (See her May '75 article: *A South Jersey Garden.*) You'll note her article exhibits a sensitivity to colors and textures; this sensitivity has been enhanced by her training at the Philadelphia College of Art.

During the rush of spring planting I try to give special thought to the placement of plants with winter appeal in my herb garden. It's a challenge because there are not many evergreens for these gardens. In spite of that, I still come up with a wealth of textures, colors and shapes.

Many herbs with fine winter foliage hold their autumn growth until the freezing depths of mid-winter. The delicate tracery of brown twigs, the golden clumps of dead winter grasses that shine in pale sunlight, and the abundant variety of herbal seedpods are included in my planning. Placed with care these plants add interest to somber, winter greens in many settings. The large number of silver plants of varied tones and textures that hold their leaves attractively, whether dead or alive, are also considered. These give light and sparkle to garden borders on gray winter days. Herbs of shrub-like growth give substance to the low profile of the winter herb beds.

A great favorite of mine is lavender, because of its ease of growth and year-round interest. Along the foundation of the house, in a raised bed edged in sandstone, the original planting, now over a decade old, still grows. These bushes could be trimmed back sharply to encourage new, compact growth, but I find the old, unevenly billowing, gray masses with their gnarled branches charming. They have for winter company shining mounds of dark green, wide-leaved, English thyme and silver mats of garden pinks. It's a cheery spot in February when *Crocus tomasinianus* opens its crowded, bright lavender cups among the greens and grays.

In choosing lavender as a permanent edging for the vegetable garden, I had in mind a purple haze of bloom swarming with a hum of bees. The winter picture, however, has proven to be no less rewarding. A hedge of mixed seedlings was planted and rooted cuttings taken from several different varieties. Now in its second season the true nature of the planting is apparent. The plants vary from compact, small-leaved bushes to sprawling, spatulate leaved kinds which seem to suffer a bit with the cold. During the winter the plants take on varying shades differing markedly from their summer tones. Some bushes are dressed in pewter, some are silver; many take on a violet blush in the cold and it is quite lovely. The row of variously shaped and tinted bushes carpeted with a collection of mat-forming thymes dressed in tones of metallic greens and burgundys makes a handsome all-season edging.

The santolinas have much to offer in the winter garden. *S. virens,* cut back sharply in the spring and grown on some of the poorest soil, holds its domed shape with very little extra trimming. Its rich, bright green is a cheery accent among the more somber winter colors. Here in November, lavender cotton *(S. chamaecyparissus)* still displays its silver, crocheted lace leaves. Foxden santolina, a gray-green form, I believe, of the silvery *S. neopolitana,* is delighting me for the first time this winter. The feathery form of the leaves give the plant a much lighter, looser look than that of the other family members.

Rosemary is planted on a warm, south-facing wall at the back door where I can pick a sprig quickly for a stew or just to sniff. English gardening books speak of training rosemary to cover a wall up to 8 ft. high. I doubt if mine will ever grow that high, but in its second year the bush seems to be training itself by growing in a wall-hugging fan of branches. Tucked into the space at its feet early daffodils and species crocus brighten late winter days.

While the common form of rue does not add much to the garden in winter, its variety 'Blue Beauty' with bushier habit and a froth of glaucous, gray-blue, lacy foliage is a treasure, holding its leaves and good looks

continued

drawings by author



throughout much of the winter. Germander *(Teucrium chamaedrys)* is an easy, always pleasing, neat growing dwarf. Often clipped for form a shining evergreen edging, it is allowed to produce its pink flowers in summer. A clipping over after bloom is all that it requires to maintain its close, shrubby habit on poor, dry soil.

Sage *(Salvia officinalis)* holds enough of its leaves to be a dark gray note in the garden picture through early winter. I am particularly fond of the colored leaf sages and find tricolor sage planted in a protected spot by the back door effective even into February. Its lovely, mauvy-grey leaves with pink and white highlights accent the terrace brick and take the place of flowers in the winter picture. I plan to plant more purple sage. Even though not truly evergreen it adds an unusual charcoal tinted violet to the early winter scene.

spring freshness

Burnet is a pleasant green winter plant with its pinked-leaf edges and fern-like appearance. A friend of mine writing from northern New Hampshire tells of her pleasure in the burnet plant I had given her; it looks as fresh as spring in that bleak period after the snow has melted before spring growth has begun.

Genista tinctoria, a dyer's shrub, is 4 ft. high in its second winter here from seed. While not having the bright green stems of many of the other brooms, it is valued because it retains many of the tiny, widely-spaced leaves on its shower of stems. These leaves take on a burnished burgundy that brightens at the growth tips of the branches. It is hardly a showy shrub but a pleasant addition to back an herbal border.

The color and texture of mat-forming thymes are almost as varied as that of heaths and heathers. Winter tints vary from deep garnet through mauve brushed greens to pewters and silver-blues. Leaves may be shiny or covered in hair, and plant habit, from true ground huggers to almost upright growth, adds other dimensions. I count on thymes for year-round good looks, finding new uses for them every year. The miniature-leaved, flat mat of mid-green *Thymus minus* makes a splendid ground cover beneath the early bloom of species crocus. I use the lovely crimson thyme, *T. coccineus*, to fill temporarily the spaces between young lavender plants. In winter the plants turn a metallic burgundy-red, a wonderful contrast to the mauve brushed grays of the shrubby lavenders, while in late June the combination of the soft crimson blanket of bloom and the silver bushes covered in soft lavender flower spikes is very pleasing.

Woolly-stemmed thyme, *T. lanicaulis,* is my most vigorous variety, washing driveway edges with puddles of a barely grayed green. Even without the generous, pink, late spring bloom it would be treasured for its fine all-year texture and color, contrasting well with the definitely silver plants. Another interesting thyme known to me only as oregano thyme makes loose, billowy cushions of large glossy leaves of an attractive, bronzy green.

A favorite here is woolly thyme *(T. serpyllum lanuginosus)* a low growing silver-gray in summer. Now it is a frosted sage-green on the warm, south-facing, brick terrace, while in a more exposed position mats of the plant have taken on a lovely mist of mauvy purple.

From the kitchen window I can see a mound of silver lemon thyme *(T. s. argenteus)* nestled between a railroad tie step and a large piece of sandstone. Flowing out onto the pebble-covered drive it looks as fresh as springtime even through the few leaves that have been allowed to snuggle among its branches for a bit of winter protection.

Another favorite for its winter and spring appeal is a variegated, creeping thyme, *T. s. aureus.* Although the variegation largely disappears in summer, the deep, glossy green leaves peppered with bright gold is a pleasant distraction during the cold months and on through spring. Golden thyme is probably a variety of *T. serphyllum.* Its winter dress may not be to everyone's liking, but I find the chartreusey gold, toned with golden brown and tan unusual and useful throughout the year.



I wish all biennials were as decorative in the winter garden as clary sage, *Salvia sclarea.* This morning the large, pebbly, frost-coated leaves look especially fresh after an all-night rain as they sparkle with diamonds of dew. Although hugging the ground all winter, these rosettes of leaves will expand at the first hint of mild weather in an astonishingly speedy fashion. Garden visitors always ask about the eye-catching clumps of frosty leaves, even before the handsome panicled racemes of bloom appear.

Another admirable biennial in the

winter garden is a lovely silver thistle, *Onopordum arabicum.* Some precocious plants have formed a snug blanket of 18 in. rosettes over the allotted space. Other smaller ones filling any spare spaces beg to be transplanted. The leaves, greener now than the striking silver of spring, hold a spiny center cushion of fat leaflets tightly covered with white hairs. The clump waits patiently for the first warm days to begin its Jack-and-the-beanstalk growth.

prickly armor

The green, rugose leaves of the flat teasel rosette stay fresh and attractive all winter. After a long cold spell I often think these look good enough to eat were it not for the prickly armor. *Dipsacus laciniatus,* a similar species with much less armament and attractive, pinnately-lobed leaves is being encouraged to make weeding a less painful task.

Euphorbia lathyrus is said to repel moles in the garden. I have not found this to be true. I like these close groups of seedlings anyway; they look like ranks of soldiers standing at attention, their single, stout, rosy-burgundy stem holds long, green leaves with pronounced pale midribs arranged in four vertical rows forming a cross.

A wild mullein or two are always allowed to make themselves at home in the herb beds. The plant did have an herbal use and I like the evergreen, large yellows, gray-green, felted leaves. This spring I am going to try *Verbascum olympicum,* a showy silver relative of the wild plant. I anticipate that the large, densely white, tomentose rosette of leaves will be an interesting addition to the winter scene as well as providing tall silver racemes of yellow flowers in summer.

Let's talk about dead branches and seed heads. Gardeners who must have absolute neatness miss a lot. In my sandy soiled garden of restrained growth, removal of summer growth is kept at a minimum. Any bare stems of interesting structure or seed are looked upon as a plus to the winter picture. I find the warm brownseed stalks of perilla and the pale, wisps of ghostly branches of Russian sage, *Perovskia atriplicifolia,* a pleasing contrast in texture and line to the rosettes and leaves of winter green. In February I am thankful for the several warm tan clumps of lemon balm, the stems strung with tiny silvery bells of the seed capsules. These stalks are a pleasant sight on a late winter's day decorated with hungry sparrows searching for the precious seed.



My roundly mounded bushes of winter savory seem to enjoy their delicate, silvery-brown cover of stems above the evergreen leaves. After a spring clipping these plants are much more attractive than the tattered bushes trimmed in the fall.

A well-staked clump of teasel is a noble ornament in the winter garden. To me, its interesting sculptural quality makes it worth coping with the inevitable carpet of seedlings each spring.

Have you ever considered fall germinating annuals to add attractive foliage to the winter garden? One that I wouldn't be without is *Nigella damascena,* called love-in-a-mist, which carpets the whole garden in an appealing, ferny mat of light green seedlings if allowed. Another good annual is larkspur which self-sows in similar feathery blankets of a deeper green.

Here Johnny-jump-ups are allowed to seed as they please. They are one of winter's small pleasures. Even after a week or two of unmitigatingly frigid weather I am almost always able to find a bright face or two to remind me that spring will eventually arrive.

The extra protection of a neighboring plant's branches has helped many precious seedlings survive their first taste of winter in the windy, open garden. The few leaves that fall here are allowed to snuggle into the plant beds. (A heavy leaf fall, though, makes this type of winter protection impractical.) I find this natural form of winter protection more attractive than a monochromatic cover of pine branches.

Seedpods in the garden not only serve a decorative purpose, they help prepare plants for the coming season of chill by reducing new growth, while permitting stems to harden and mature. That activity is often the deciding factor in the survival of our precious plants of questionable hardiness.

Now is the time to view your garden's winter effect with a fresh, critical eye. The textures of brown, dying leaves and the straw and green tweed of winter lawns are beautiful in a way quite different from the lush, fullness of summer. You may find that you are overlooking the value of some quite ordinary plant, be it leaf, mass or seed interest. Taking the time and thought to view winter's offerings for their own appeal may be a definite gain to your winter landscape.

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Ernesta D. Ballard is president of the Pennsylvania Horticultural Society. She first entered a miniature garden in the 1963 Show, the first year the horticultural section was included in the Show. Although miniature gardens had been created in England for decades, the response here from horticulturists was negative and bewildered. Ballard entered another in the '67 Show and after that miniature gardens began to catch on.

Flash: This garden won the Bronze Medal Ribbon for the outstanding Blue Ribbon winner in the Container Grown Classes at the '75 Harvest Show.



ALL THINGS SMALL & GREAT

Miniature gardens and landscapes are a challenge and a pleasure to assemble. Here are four gardens and landscapes selected from the 1975 Flower & Garden Show. Each exhibitor tells in her own way what went into their construction.

photos by Edmund B. Gilchrist, Jr.

by Ernesta D. Ballard

This miniature landscape has been exhibited in three consecutive spring Shows. It is planted on a flat stone collected in the Roxborough hills above the Wissahickon. The stone is gray in color, with flecks of mica accentuating its pleasing grain. Several plant pockets were hollowed out with a cold chisel, all draining into one hole that goes all the way through the rock.

The planting is wintered in a cold frame, forced in a cool greenhouse for six weeks before the Show and summered in the shade of a grape arbor. The number labels are visible and identify the plants. The box, horsetail and tiny flag are firmly attached. Their roots are covered with moss.

1. Sweet alyssum - *Lobularia maritima.* From seed sown in November 1974 and planted in February. Judges' comment: "Not appropriate."
2. Miniature horsetail - *Equisetum scorpioides.* Planted in January 1973.
3. Chinese sweet flag - *Acorus gramineus pusillus.* Planted in January 1973.
4. Babys tears - *Helxine soleiroli.* Planted in January 1973. Needs constant restraining.
5. Dwarf box - *Buxus sempervirens suffruticosa* 'Kingsville.' Planted in January 1973.



by Marjorie Edgren

The garden, constructed of a dark brown sandstone (brownstone), measures about 21 in. in diameter and 6 in. high. It is mulched with small chips of crushed slate (also dark brown in color). Among a total of 23 species used in the planting are small evergreens *Juniperus procumbens nana* (center top) and *Ilex crenata* 'Green Dragon'; mats of tiny, green *Mentha requieni* around the edge; rosettes of silky *Androsace limprichti* and spiky *Armeria caespitosa;* silver accents including lanceolate leaves of *Primula frondosa* and mounds of *Raoulia australis*; with *Viola yakusimana* and *Centaurium scilloides* (both right front), their tiny blooms adding a touch of color. Small *Drabas* (spp. *aizoon dedeana, mollissima, polytricha,* and *olympica)* nestle in crevices.

Marjorie Edgren writes:

"This is one of my favorite classes and I find it virtually unique among U.S. flower shows. I have entered it every year since first noticing it in 1969, and have won prizes several times (first place '70 through '74). Having first participated in the Show as a resident of the Delaware Valley, I returned to continue my association with it from northern New Jersey. This year I shall relocate in Ann Arbor, Michigan."

Complete list of plants used in garden:

1. *Androsace limprichti*
2. *Antennaria sp.* (Wallowa Mts.)
3. *Arenaria balearica*
4. *Armeria caespitosa*
5. *Centaurium scilloides*
6. *Dodecatheon pauciflorum*
7. *Draba aizoon*
8. *Draba dedeana*
9. *Draba mollissima*
10. *Draba olympica*
11. *Draba polytricha*
12. *Erigeron trifidus*
13. *Erodium chamaedryoides roseum*
14. *Frankenia thymifolia*
15. *Ilex crenata* 'Green Dragon'
16. *Juniperus procumbens nana*
17. *Mentha requieni*
18. *Primula frondosa*
19. *Primula marginata*
20. *Primula villosa*
21. *Raoulia australis*
22. *Thymus minutia*
23. *Viola yakusimana*

continued

Anita Kistler is vice-chairperson of the Delaware Chapter, American Rock Garden Society. She is a consistent Blue Ribbon winner in the horticultural section of the Philadelphia Flower & Garden Show.



by Anita Kistler

If you could have seen the piles of stones that I handled and contemplated in the creation of this miniature landscape, you would have wondered what was being constructed. Actually the overall size is small. The container is 18 in. long by 13 in. wide and only 11 in. to the tip of the rhododendron on the right.

The hardest part of the landscape was finding stones to match each other in texture, color, size and shape to give a unified effect. The stone texture effect had to be "in scale" with the small plant material I planned to use. Whenever I see a very textured stone on our 10 acres, I pick it up and stockpile it for future use in miniature landscapes or gardens. Even with my backup supply, over half a day was spent constructing the rock formations. I constantly referred to *Saikei: Living Landscapes in Miniature* by Toshio Kawamoto, for the oriental feeling I hope to attain.

Being an avid rock gardener with a mania for tiny plants, I have a fair supply of small plant material. So selecting the compatible plants was easy. Here I used plants that grow in half shade in acid soil, determined by the little *Rhododendron impeditum.* This rhododendron is perfectly hardy in our Delaware Valley area gardens. It has deep purple blooms, and in 12 to 15 years is only about 12 in. high and 24 in. across. It is a good choice for miniature work because the trunk has the character of an aged mature shrub, and the foliage is very small, in good relationship to the size of the shrub.

Buxus microphylla compacta is used at both ends of the container. This is a slow-growing boxwood. The plants used were four-year-old cuttings I had taken from our mature specimen, which is now 7 in. high and 18 in. across at 21 years of age.

On the left hummock is *Arabis sturri,* a nice mat-forming white flowered wall cress planted in the moss. Fortunately, last winter was mild, because I spent an enjoyable half-day walking through our woods collecting pieces of moss as large as possible. On the right hummock are several plants, with only *Arabis procurrens* being evident in the photograph. The other plants are *Mentha requieni,* Corsican mint, a tiny round-leaved ground cover with the smallest of lavender blooms and a pungent mint odor when rubbed,

continued

Jean Salter is part of a five-member family committed to producing the highest quality original designs for plant containers in wire, metal and clay. She designs pottery and garden pieces. The family began to enter their material in the competitive horticultural classes in the 1974 Show. They work out of their home in Chester, Pa.



and *Bellium minutum,* a wee white daisy growing out of a mat of spoon-shaped leaved rosettes. The buds are attractive little red balls that open into white rays with red reverses, on 2 in. high stems.

This planting was not a temporary Show exhibit, but is a permanent miniature landscape as long as I continue to water and tend it. At this writing it is seven months old and nothing has outgrown its allotted space.

by Jean Salter

Miniature gardens are a very intimate style of gardening, realistic or fantasy, a plan for a larger garden or something you cannot achieve, a castle if you so desire.

The knot design was originated during the medieval period to use a small garden area for medicinal and culinary herbs and to be both decorative and functional. My garden was drawn to the scale ¾ in. to 1 ft. The redwood box is 15½ in. long by 13 in. wide; it is treated with cuprinol, the wood preservative. It is deep enough to sustain all plant material. In fact, there is so little exposed soil that watering consists of a weekly drenching. The bricks for the wall and walks were rolled, cut, fired, and epoxyed onto waterproof masonite and exterior plywood. The fence was cut out of thin wood, stained and sealed. After a few weeks it became discolored, so I used grey oil paint toned down with burnt umber.

The plants in the knot are saginia, golden babys tears, nertera and English babys tears. The latter I have replanted with Brazilian peperomia, which is slower growing and makes it easier to maintain the pattern. The English boxwoods, the myrtle on the fence, the acorus in the pool, and the ivy on the wall have stayed in scale since the Show.

●

fiddling with ferns



Sori on upper frond of *Didymochlaena truncatula*

by Stuart Simon

Stuart Simon is a doctoral candidate in Educational Administration at Temple University who is not-so-gradually defecting to horticulture and botany. He has received a grant to study in Germany, where he is currently researching his dissertation, a comparative study of public service programs in German and American botanical gardens and arboreta.

photos by M. S. T. Harpo

As a frequent habitue of the Pennsylvania Horticultural Society's monthly plant clinics, I have often witnessed a most lamentable sight—people from all over the Delaware Valley hurrying into the clinic anxiously clutching small clay coffins bearing the remains of some treasured, but recently departed fern. Invariably, the source of the problem lies in the grower's lack of knowledge about fern cultivation in the home. Many people who have tried to grow ferns at home, and many who have been afraid to try, are often awed by the mystique surrounding the culture of these most interesting, but little understood plants.

Most of the ferns we grow as house plants come from the tropical or subtropical regions of the world. These areas form a large part of the world's surface and have diverse climates. In general, ferns inhabit those tropical areas that are moist, humid, somewhat cool, and suffused by filtered sunlight. Ferns are not only terrestrial, but also dwell high in the trees, creep along rocks, and perch in the cracks of rocky cliffs.

People who are not familiar with the widely diverse forms, colors, and growth patterns of ferns, assume that all ferns are green and plumose. Ferns range in green from the pale, silvery green of staghorn ferns *(Platycerium sp.)* to the robust green of holly ferns *(Cyrtomium sp.)*. Some fern fronds are red or pink when they are new, such as maidenhair, doodia, and blechnum. A most unusual fern, *Didymochlaena truncatula,* and *Adiantum hispidulum* both have reddish mature fronds. *Polypodium mandaianum glaucum,* a bear's foot fern, has pale, bluish-green fronds with wavy edges. Of the many variegated ferns, varieties of *Pteris cretica,* such as *albo-lineata* and 'Victoriae,' have silvery-white markings on their fronds. The gold-back fern *(Pityrogramma calomelanos aureo-flava)* and the silver-back fern *(Pityrogramma calomelanos)* are named for the colorful secretions exuded by glands on the fronds.

Ferns vary enormously in size also, from the diminutive *Polypodium piloselloides,* a creeper with three-quarter inch fronds, to the huge staghorns, which can grow to 6 ft. or more. Within this range, anyone can select a size that fits into his or her decorating needs. As far as shape is concerned, ferns display as exciting an array as flowering plants. The epiphytic staghorns have tough, oddly-shaped fronds, some of which are pressed tightly against the potting medium, the others drooping in long bifurcated fronds. Maidenhairs have typically elegant, finely-cut fronds, while the stately tree ferns display tree-like trunks from which the fronds develop. One of the least known, most unusual, and loveliest ferns, in my opinion, is the climbing fern *(Lygodium japonicum)*. Its lacy fronds can grow several feet high, clinging to any available support—including your best curtains. As you can see, ferns deserve a prominent place in any home plant display.

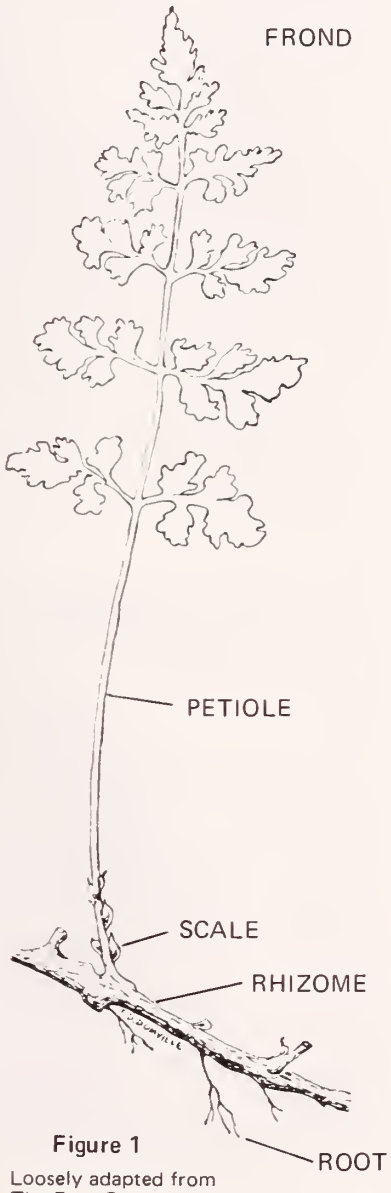


Figure 1

Loosely adapted from
The Fern Guide,
Edgar T. Wherry, Ph.D.

what makes a fern a fern?

Most people think they have found a fern when they see a plant with fine, delicate-looking foliage. While it is true that many ferns do exhibit such characteristic foliage, many do not. Often, many plants that possess such "ferny" foliage are not ferns at all—for example, *Pilea microphylla* (the artillery plant), and *Asparagus sprengeri* (the asparagus "fern").

If we can't identify a fern on the basis of its foliar characteristics alone, how *can* we identify a fern? The best way to answer this question is to describe the characteristics of a fern and how it grows. We can then see how ferns are similar to other plants and how they are different.

Figure 1 shows the various parts of the fern. The frond, or leaf, is normally attached to the rhizome by a stipe or petiole. The fact that the stipe is attached directly to the rhizome indicates that the rhizome is really a modified stem that travels horizontally along or under the soil. As the rhizome creeps, roots develop from its underside. Many fronds when they are young are in a coiled position, the characteristic crozier or fiddlehead.

The primary characteristic that distinguishes ferns from other plants is the production of spores. Unlike flowering plants, ferns produce no flowers, and therefore no seeds. They reproduce by means of microscopic one-celled spores that are borne in structures called sporangia on the underside of the frond. The sporangia occur in clusters

continued

ferns

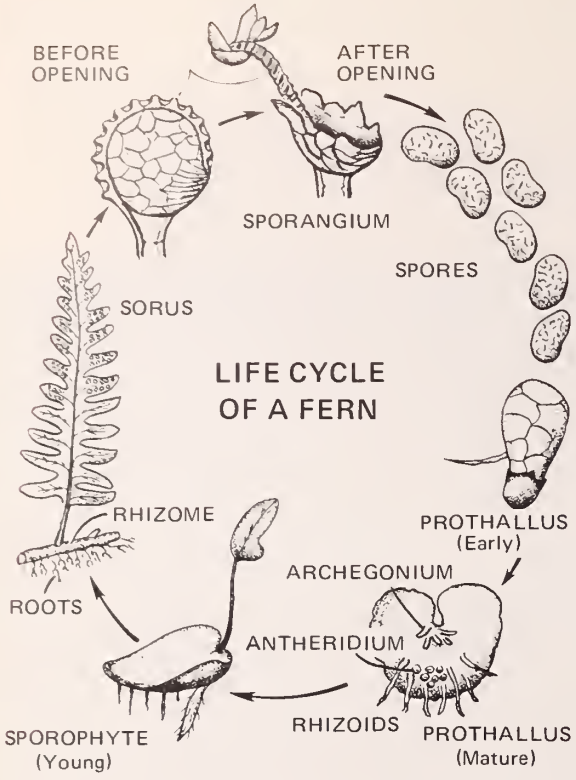


Figure 2

Loosely adapted from *Ferns to Know and Grow* by F. Gordon Foster (published by Hawthorn)

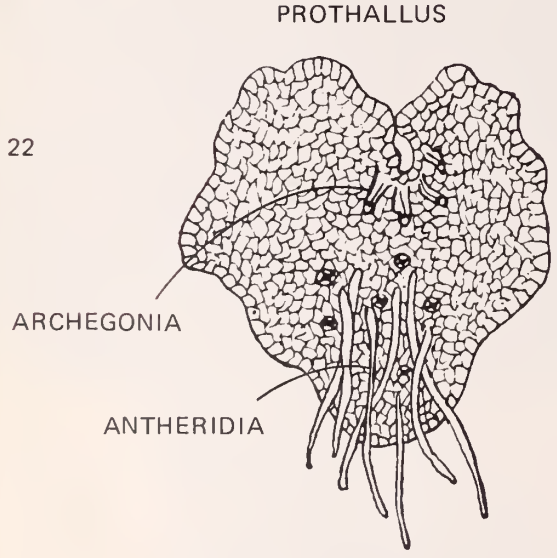


Figure 3

called **sori**, which may be covered by a protective layer of cells, the **indusium**, or may be naked. The sori form characteristic patterns in each species and these patterns are a primary means of identifying different species. Figure 2 illustrates the reproductive process in ferns. When the spores are ripe, the sporangium opens and the spores are released. They fall to the ground and, if conditions are satisfactory, they grow into a many-celled organism called a **prothallus.** Figure 3 illustrates the underside of the prothallus on which two distinctly different structures are formed. The **antheridium** or male structure produces motile sperms, which fertilize the egg in the female structure, the **archegonium**. After fertilization occurs, the fertilized egg develops into our characteristic fern plant, on whose fronds spores are formed, thus starting the process of reproduction again.

The rhizome, or modified stem, is an important characteristic in identifying ferns. Unlike most flowering plants, which possess erect stems, many ferns have horizontal, creeping rhizomes, which can be over three-quarters of an inch thick or less than one-sixteenth of an inch. Several types of rhizomes exist. Those in maidenhair ferns (adiantum) creep slowly along under the ground and send up fronds from points along the upper surface. In maidenhairs the rhizome is hardly visible until it eventually creeps up to the soil surface. A second type of rhizome grows in a circular mound from which the fronds emerge forming a crown; the bird's nest fern *(Asplenium nidus)* typifies this form. A third type of rhizome grows horizontally above ground, rather than below, and tends to be somewhat thicker than the underground type. They creep along the surface of rocks, soil, or tree limbs. This type of rhizome is associated mainly with epiphytic ferns (those that grow on trees and rocks). These rhizomes are commonly referred to as "feet." Three such footed ferns are davallia, polypodium, and *Aglaomorpha.* Another type of rhizome forms a kind of trunk, which gives the fern a tree-like form. Alsophila, blechnum and dicksonia are such "tree ferns."

In order to recognize a fern *all* parts of the plant must be examined. Immature fronds will not produce spores and also may not be similar in appearance to the mature fronds.

caring for ferns

Environmental aspects of fern culture, such as humidity, temperature, water, soil, and light, are interdependent and must be regulated to suit the rate of growth of your ferns.

humidity

Normally, ferns require at least 50% relative humidity in order to thrive. The leathery-leaved species can do well with less humidity, while others, such as *Polypodium piloselloides* and the viviparous fern *Hemionitis palmata,* need 90-100% humidity. It is, therefore, important to know the special humidity requirements of your ferns. Since most homes do not have sufficient humidity for flowering plants, much less ferns, you can increase moisture in the air several ways. You can group the ferns on top of pebbles in a nonporous tray. Water placed in the bottom of the tray evaporates to create humidity around the plants. Be sure not to let the ferns stand in water, however. Misting plants with a hand fogger provides added moisture, or a cool mist humidifier can humidify a whole room. For ferns that require a high humidity of 90% or more, you must use a terrarium or similarly enclosed container. The terrarium can be landscaped to display your ferns in an attractive naturalistic "rain-forest" setting.

light

Ferns prefer bright light for quick and luxuriant growth, but usually cannot tolerate full sun, which can bleach their foliage. In fact, ferns do well in windows where flowering plants will not flower and stay compact. North and west and east windows are ideal for ferns. Ferns in a southern window require some protection from the sun, especially in the summer. A translucent curtain placed between the window and the plants can serve that purpose.

Although bright, filtered light hastens the growth of your ferns, these adaptable plants will thrive even in very low level light. Many growers have recently discovered that ferns



Platycerium bifurcatum displays its shield fronds pressed tightly against the potting media and the fertile fronds hanging downward.



Polypodium piloselloides. (Compare the size of the fronds with the quarter in the plant.)

grow at an accelerated rate under fluorescent light, particularly at the extreme ends of the tube. An efficient set-up would be a 48-in., two-lamp fixture. Cool white lamps are the least expensive, the easiest to obtain, and excellent for growing ferns. If, however, you want to combine your ferns with flowering plants, a combination of one cool with one warm white, or one cool with one Gro-lux wide spectrum, is ideal. It is not necessary to use the more expensive, so-called "plant lamps." Since the fronds of some ferns turn brown under too intense a light, it is wise to start them 10 in. or more from the lamps, gradually moving them closer. One thing I have discovered is that fluorescent light makes ferns grow almost too well.

potting media

It is generally recognized that the consistency of a potting medium is more important than specific elements it contains. Any nutrients the medium lacks can be made up by adding fertilizers. I have found that ferns do well in a spongy, porous, and well aerated potting medium. The medium should retain water easily, but not let the water create a sodden condition in the pot. The medium must be sufficiently well-drained so that water will run through quickly, yet enough moisture must be retained in the pot. I have used the more traditional potting media, as well as the newer soilless mixtures, and have found that all provide excellent growing conditions for ferns, as long as the medium fulfills the above conditions. Here are recipes for the three media I use most often:

Soilless Medium (Cornell Mix)
Two parts sphagnum peat moss
One part vermiculite
One part perlite

Soil Medium
One part Baccto potting soil
One part Black Magic Planter mix

Gourmet Medium
Three parts pasteurized leafmold or rotted log
One part sharp sand
One part vermiculite

Although most ferns thrive in an acidic mixture, many ferns, such as the maidenhairs, the hart's tongue fern *(Phylli-*

continued



Pteris cretica albo-lineata has silvery variegated fronds.

tis scolopendrium), and the tiny spleenworts *(Asplenium trichomanes* and *A. platyneuron)* prefer a more alkaline condition. For such lime-loving ferns, you can increase the alkalinity of the potting medium by adding marble chips, crushed oyster shells, or ground limestone. An occasional watering with a suspension of ground limestone in water is also efficient.

watering

People often ask about watering ferns, assuming that there's a formula. Learning to water is one of the most difficult plant techniques to master. Each plant has its own requirements according to its species, size, rate of growth, the material and size of pot, and the humidity. All these factors will influence the amount of water a plant requires.

Most ferns require more moisture at their roots than flowering plants. Many can stand only one or two dryings before the fronds turn brown. I normally water each fern thoroughly when the potting medium feels just barely moist. I never let the medium reach the point of dryness, at least not since several "accidents" left me with crisped fronds. The tougher-leaved species, such as *Cyrtomium falcatum* and *Asplenium nidus,* can withstand drought conditions more than the maidenhairs, which crisp at the hint of dryness. One way to reduce frequency of watering is to use plastic pots, which tend to retain moisture longer than clay pots. Considerably less water will be needed during the fern's dormant or rest period.

If, despite your best intentions, you should forget to water a fern and all the fronds dry out and turn crisp, don't discard the plant. I have found that the rhizome has miraculous regnerative powers. Ferns that I feared lost began producing new fronds from the dormant rhizome. So, never discard a fern that seems dead, but water sparingly, cut off all the dead fronds, place the plant in a plastic bag or terrarium to increase the humidity, and you may be surprised to see new fronds coming up.

fertilizing

Although ferns differ in their response to fertilization, all the cultivated ferns that I'm familiar with benefit when properly fertilized by growing faster, larger, or both. In order to prevent damage from an excess of fertilizer salts collecting on or near the plant tissue, select fertilizers with reputations for low burn and follow the directions carefully. Such low burn fertilizers are fish emulsion (5-2-2), Blue Whale (6-2-1), Orchid Spoonit (30-10-10), Hyponex (7-6-19), to name a few. Should fertilizer salts accumulate, however, on the surface of the soil or the edges of the pot, flush thoroughly with water.

Most fertilizers should be applied once every three weeks during active growth; they should be withheld during the fern's rest period. Some ferns that continue to grow without an apparent dormant period can be fertilized throughout the year.

pests and diseases

Like all plants, ferns are susceptible to pests and diseases. Unlike many other plants, however, ferns are also particularly sensitive to pesticides, which can often cause more damage than the pests. Prevention of pests and diseases, therefore, is mandatory.

The best way to ward off plant pests is to examine the foliage carefully. This chore is easy to do when you water and fertilize your ferns. With care you can catch pests in the early stages, rather than being surprised by a heavy infestation later on.

For leathery-leaved ferns, use insecticides such as Malathion to treat aphids, scale and mealy bugs. Kelthane is effective for spider mites. Since Malathion is too harsh for the more delicate ferns, such as maidenhairs, I suggest spraying them with a nicotine sulphate solution (Black Leaf 40) mixed with a small amount of mild soap. The fern should be placed in a plastic bag for a few days to permit the fumes to destroy the pests. Check regularly for any surviving insects and repeat the treatment as necessary.

To prevent pests from attacking my plants, I wash the foliage weekly and encourage strong, healthy growth by using proper cultural techniques. Also, to prevent fungi from attacking the ferns, I avoid wetting any exposed part of the plant during damp, cloudy weather.

temperature

Ferns are not demanding about temperature. They like it cool, which is why they flourished in Victorian parlors. However, they will adjust to warmer temperatures—even an occasional sweltering 90°—but demand a higher humidity and even more careful attention to watering than usual. Like all plants, they should have a 5° to 10° drop in temperature at night.

Part I of a two-part series on ferns. In Part II, Simon will deal with unusual ferns and interesting ways to pot them.

Although *Blechnum gibbum* is a miniature tree-fern and does not reach the heights of the larger kinds, its upright rhizome displays the characteristic trunk.



sources for tropical ferns

Edelweiss Gardens, Robbinsville, NJ 08691
Fischer's Greenhouses, Linwood, NJ 08221
Logee's Greenhouses, Danielson, CN 06299
Merry Gardens, Camden, ME 04843
The Greenhouse, Meadowbrook Farm, Meadowbrook, PA 19046
Roehrs Exotic Nurseries, Rutherford, NJ 07070
Waterloo Gardens, Devon, PA 19333

Also, variety and department stores occasionally stock some interesting and unusual ferns. Keep your eyes open.

fern societies

American Fern Society, Dr. Dean P. Whittier, Vanderbilt University, Nashville, TN 37235
British Pteridological Society, Mr. J.W. Dyce, 46 Sedley Rise, Loughton, Essex 1G10 1LT ENGLAND
Delaware Valley Fern Society, Mr. Ron Goldstein, Old Newport Pike, Cochranville, PA 19330
Los Angeles International Fern Society, Mr. Wilbur Olson, 2423 Burritt Ave., Redondo Beach, CA 90278
New York Chapter of the American Fern Society, John Michel, New York Botanical Garden, Bronx, NY 10458

reading materials

Behrends, Dorothy and Sylvia Leatherman. *Learn of Ferns We Grow* (Fern Press: Los Angeles International Fern Society, 1965).
Fern Lessons (Fern Press: Los Angeles International Fern Society).
Foster, F. Gordon. *Ferns to Know and Grow* (Hawthorn Books, New York, 1971).
Hoshizaki, Barbara Joe. *The Fern Growers Manual* (to be published later this year).
Wherry, Edgar T. *The Southern Fern Guide* (Doubleday and Co.: New York, 1964).

Also, consult the floras of individual states and countries for information on tropical ferns. These publications often list the species found in the region and include pictures and descriptions of the habitat of the ferns.

●

ah...the silvers

by Lee Raden

Lee Raden's interest in silvers was sparked by a recent visit to Scotland to Jack Drake's Nursery in Inverness where the plants are grown to perfection.

If anyone had told me ten years ago that I would be writing an article about silver plants, I would have laughed; I thought all the silver plants looked sick. The problem is they just sit there unobtrusively, but suddenly you find yourself attentive to the little devils.

Most of us are familiar with the weedier type silver plant. I don't mean to insult the reader with the word "weed"; I subscribe to the definition that a weed is "anything you don't want in your garden." I extend the definition to any plant that rampantly grows an inch-a-day. That is not the type silver plant I am discussing. For example, *Cerastium biebersteini,* or *Cerastium tomentosum* are grown in the Delaware Valley, and if left to their own devices you will have a silver garden consisting of one plant.

The silvers are worldwide in their habitat. However, they do have one thing in common; they generally come from areas with warm and dry summers, which they need for a restrained growth.

So, how do we propose to grow plants that come from the parts of the world where once winter is over, it is over completely. In those places spring means melting snows and the beginning of drought. Summer is hot and the sun beats down unmercifully until fall snows. Philadelphia with its 95°F. and 95% humidity is far from their native habitat and then our winters are rain, followed by sleet, followed by snow, followed by thaw, which is the final blow. In the Delaware Valley, they are best grown in pots in alpine houses, cold frames, cold Florida rooms and breezeways. Thus protected from the Philadelphia elements, a random sampling of twelve silvers will bring you much contentment with their quiet sophistication and beauty.

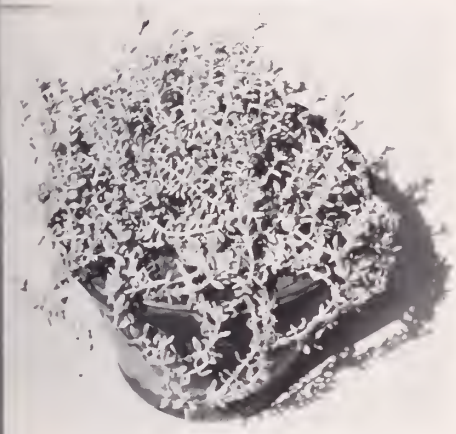
Saxifraga stribryni. This wonderful saxifrage is part of the kabschia section, sub-section Mediae, or 'Engleria' saxifrage. It has magnificent small red flowers. Its native habitat is the mountains of Northern Greece and Bulgaria. The rosettes are of silver-white and, in the Delaware Valley, it sometimes succeeds outdoors in a sheltered spot facing north, mulched with lime chips. The plant blooms in March; therefore, to see it bloom to perfection it should be grown under cover.



photos by Edmund B. Gilchrist, Jr.

Saxifraga diapensioides, sub-section Rigidae. This wonderful saxifrage comes from the Southwest Alps in Italy and Switzerland. It cannot tolerate winter wet but grown in a pot in a cold location the small rosettes become nail-hard and are spotted silver. A simply magnificent saxifrage to be grown and loved. It cannot be grown outdoors in our area.





Veronica bombycina (Scrophulariaceae). This native of Lebanon is probably one of the finest silvers. When it flowers in late spring with its small pear-shaped blue flowers, against its own background of silver, it is breathtaking. We sometimes see it grown on the west coast, very seldom in the Philadelphia area. The plant can become lax in its growth and all it needs is a very hard shearing with manicure scissors in early spring. That will induce side branching and a compact plant.

Plantago nivalis (Plantaginaceae). I can hear the abuse now, "Plantago is a weed!" You're wrong! This little beauty from Spain is covered with silk hairs and is probably one of the most exquisitely rosetted plants available. Winter wet on the crown of the plant will very quickly put it on the compost pile. A rocky, sandy soil mixture will bring out the rosettes to their hairy-silver perfection.





Helichrysum virgineum (Compositae). Orange-pink flowers in bud, open to a creamy-white. The silver-grey leaves and neat furry stems are a glistening sight. What more can you ask from a plant that comes from Mount Olympus in Greece? Sandy soil and letting the plant become pot-bound will help it to flower.

Teucrium aronanum (Labiatae). This very small completely grey-leaved plant has blooms of purple-red resembling an open-faced snapdragon. It is native of Southern Europe and can be grown outdoors in a protected southern exposure. It likes to creep around and it will do very well under a protected southern exposure.



continued

ah... the silvers

Eriogonum ovalifolium (Polygonaceae). A plant from the mountains of Northwest United States; silver-grey covered with hairs and a bloom spike a few inches in length of the purest white. This is another plant that cannot take our wet winter; it is kept dry in its native habitat by a top covering of snow.





Verbascum dumulosum (Scrophulariaceae). Another weed! This one from southwest Anatolia was only discovered about fifteen years ago. It is a small shrub with woolly stems, leaves of the softest grey-white covered with wool. In May, a profusion of three- to four-inch spikes of bright yellow bloom. A super pot plant. In England, it continues to win blue ribbons. To view this plant is to want it forever.



Synthyris lanuginosa (Scrophulariaceae). A native of Olympic Mountains in the State of Washington, its rosettes are almost fern-like in appearance. In early summer the beautiful blue flowers bloom and are offset by the silvery leaves. You stand awe-struck with what you have been able to do in a single pot. Many plants come to perfection when pot grown, and how nice to view the plant from any aspect and level.



Salix lanata (Salicaceae). Willows? The one tree that in the Delaware Valley area does two things; invariably it blows down in winter storms or it clogs your septic system. But, *Salix lanata* grows in Northern Scotland and is never higher than three inches. Its leaves are covered with white wool and in the spring beautiful pussywillow-type blooms are a golden-yellow in color. The plant needs continual watering during its summer growing period.



Helichrysum plumeum (Compositae). This small sub-shrub is a New Zealand plant that, true to its origins, produces small white daisies. No one yet has been able to discover why New Zealand plants are generally white, and why the great composite family is so wonderfully represented. Just think about it for a moment; a silver, hairy shrub with white daisies. Try to get it and grow it on your cold porch. You'll need cuttings for the plant to grow. New Zealand seed looses its viability in a matter of days.

Leucogenes leontopodium (Compositae). Another New Zealand plant. As you probably guessed the plant's counterpart is the famous edelweiss of Europe, but what a difference. This plant is a beautiful shrub with silver foliage that gleams, the silver-grey leaves are covered with silk hairs. To my mind it is one of the finest shrubs in cultivation today. This plant is literally the show-stopper of any collection. The gem of gems.



I am sure many of you are wondering where you find these wonderful and unusual plants. The answer is through The Pennsylvania Horticultural Society, and seed exchanges of many plant societies and botanical societies. The research to find the seed, or the plant, only makes the growing the more delicious. Self-addressed inquiries to me, c/o PHS will be answered promptly.

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AWBURY ARBORETUM

GREEN SPACES IN THE CITY

photos by Edmund B. Gilchrist, Jr.

"The lack of continuity of purpose from which so many old places in and near our large American cities have suffered, fortunately will not afflict Awbury. The arboretum is fortunate also in having an endowment fund to provide for its maintenance which is not subject to the fickleness characteristic of most city councils owing to the frequent change in their political complexion. Cooperation on the part of the various gardening and civic organizations in Philadelphia will result in a pooling of interests so that projects similar to that of Awbury will be inaugurated."

by John W. Harshberger, Professor of Botany, University of Pennsylvania
(The Old Gardens of Pennsylvania)
The Garden Magazine, June 1921

by Nancy Clark

Nancy Clark is the director of the Awbury Arboretum. After a liberal arts education, Clark trained in horticulture at Temple University, Ambler Campus. During a work-study program there, she worked at Wyck, an historic house on Germantown Avenue. While there she worked in restoration gardening, a subject of particular interest to her.

Now, more than 50 years after Mr. Harshberger's article appeared, Awbury shows the pressures of time passing. The depression of the 1930's significantly undercut the value of the endowment. Inflation forces the Arboretum to get by with reduced labor, supplies and services. Additionally, the move in the last decade has been to incorporate Philadelphia parks into the Fairmount Park System leaving Awbury as one of the few privately owned and maintained parks within Philadelphia.

Awbury began in 1853 when a 40-acre tract of land in East Germantown was purchased by Henry Cope as a summer home for himself, his wife and their three children. The two sons, Thomas and Francis each had a house



Summer youth corps workers caught on quickly to pruning techniques. The author, also director of Awbury Arboretum, stands back to check aesthetics.

built at Awbury and it soon became the family's year-round home. Thomas did most of the original planning of the estate grounds and the planting of trees, shrubs and flowers. Edwin C. Jellet, the historian and author of *Gardens and Gardeners of Germantown* writes: "Awbury is one of the largest, one of the finest and on account of its family life the most interesting of many family estates. It is like a great park with walks, drives, rare shrubs, trees and richly stored gardens."

In 1916 a large part of Awbury was given by one of the Cope descendants, Caroline Cope, to the City Parks Association, an organization formed in 1888 for the development, preservation, and improvement of parks and resting places in Philadelphia. Although Awbury is a public park, many people even some living in the Germantown, Mt. Airy vicinity don't know where it is. The Arboretum lies between Washington Lane and Haines Streets, Chew Avenue and Ardleigh Street with several acres located on the northwest side of Washington Lane. The main grounds of the 55-acre park surround the section of private residences at its core. Life within the Awbury community retains much of the spirit of the past. Descendants of the Cope family and others share information about events and discuss common concerns. There is no through traffic so dogs and children can run free. Most of the houses are constructed of Pennsylvania stone. One of the houses, built in 1793, was made from stone quarried from within Awbury. The pastoral life persists even though Center City is a short train ride away.

It was living at Awbury that stimulated my interest in studying horticulture. After graduation from Temple's School of Horticulture, I was fortunate to be appointed as the director of the Awbury Arboretum. The position combines work in ornamental horticulture, park management and landscape and garden restoration.

Money to run Awbury comes from interest on the original endowment, private contributions and rental income from park-owned properties. These funds do not come close to meeting the expenses of care of the Arboretum. Consequently, in the last 15 years particularly, Awbury's staff has been reduced and upkeep has been cut to a bare minimum. The plantings established by Thomas Cope and subsequent landscape architects, such as Professor Arthur W. Cowell of Penn State University, have become overgrown. Lovely specimen plants are covered with honeysuckle and poison ivy vines, and volunteer maple, ash and horse chestnut seedlings abound spoiling the visual aesthetics of the plantings.

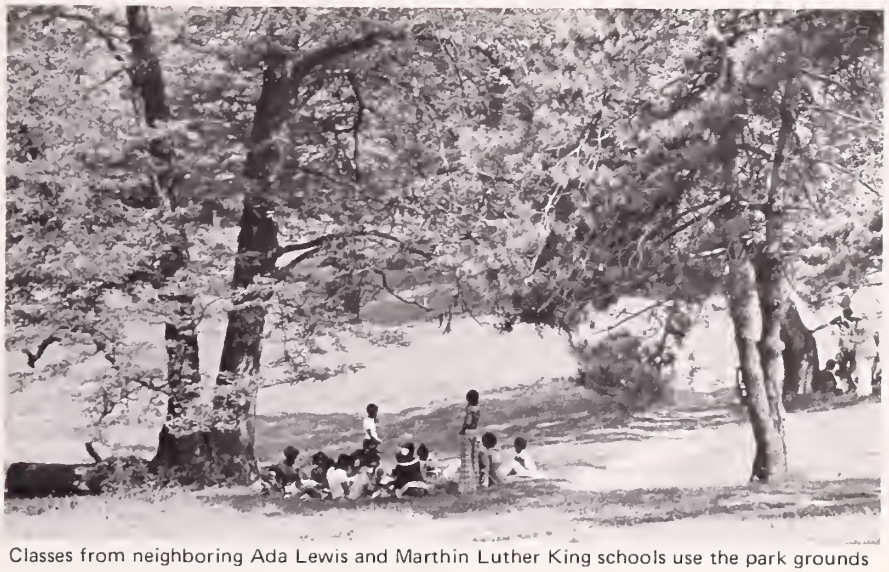
Records of plants and their locations within the Arboretum are few and of limited value since many individual trees and shrubs have been vandalized or succumbed to neglect. The first step in my plan to reclaim some of the interesting plant material in Awbury is to work along the drives and walkways that are the areas most used by the public. Work here is very time consuming because it involves the removal of vines, dead wood and other materials. We need to prune low branches to facilitate mowing as well as selectively remove unnecessary plant material to reopen some of those picturesque vistas that gave Awbury so much of its original beauty.

A by-product of working in these well-traveled areas is one that I anticipated and hoped for. I am visible to park users. They can see that a change is beginning to take place in the maintenance of the grounds. We talk and they suggest ways to improve the park and to increase community involvement. I also have the opportunity to do some on-the-spot re-education to encourage more aware and respectful park usage. People coming into the park to relax know that there is someone interested in their ideas and open to their recommendations, someone who will use these ideas to effect change. They benefit and so does the park.

One landscape feature of Awbury with great potential for restoration is the pond area. A spring flows along through a bog and down to a series of three ponds. The ponds are filled with silt, overgrown with willow trees and weeds and the water flow has been slowed and is stagnating. Students from alternative East High School in Wyncote and summer Neighborhood Youth Corps workers have worked to map out the shape of the original ponds. A channeled water flow has begun and their pioneering work offers the possibility of reclaiming the pond areas. Now that the brush has been cleared and water flow started, the next step is to dig a silting pool to counteract the natural silt build-up. In the near future the bog area will be upgraded with plants that thrive in marshy environments. The area makes a perfect outdoor laboratory in our newly developing educational program.

A planting of 50 trees through the Pennsylvania Horticultural Society's 10,000 Trees program is also a big addition for expanding our role in community education. The size and diversity of our collection is being increased and a special bark trail area including persimmon *(Diospyros virginiana),* Chinese cedrela *(Cedrela sinensis),* saucer magnolia *(Magnolia soulangeana),* and others is now laid out. This past summer the Neighbors Community Program of Germantown asked Awbury to hold classes in horticulture for interested persons 14 years and older. Topics covered were propaga-

continued



Classes from neighboring Ada Lewis and Marthin Luther King schools use the park grounds for nature studies and picnic lunches.



This rock spillway gives a clue to the structure of the Awbury pond now mostly silted in and overgrown.

The '52 Ford is less complicated to operate and maintain than newer machines. Here the author checks the sediment bowl for any dirt in the fuel line. In the past years equipment was run without a regular maintenance schedule. After repairing major breakdowns, a preventive maintenance schedule was established.

Restful scenery, cool shade and curving paths are attractive to runners, bicyclists and people who just want to stroll.





tion, maintaining home landscapes, identifying trees and caring for house plants.

Finding ways to get things done economically and suitably is a constant challenge. I lean on advice and consulting help from friends and other professionals in the field, services provided by the state, and the generous assistance of regular volunteers. As director I learn something new and helpful for the park everyday. Since our permanent staff consists of only two people and since financing is so limited, I'm learning to make repairs on the tractors and other equipment so we don't have to call the repair man so frequently. I'm mastering the ropes of administration and coordination with community groups to stretch our resources, develop new ones and expand our services to the community. Awbury is not a part of the Fairmount Park System and as such does not receive the help of specialized equipment and trained personnel that other city parks receive.

Within the 55 acres of park land there are several areas that deserve special care and attention. One is the pond and bog location and another is the old Cope Garden. This garden was once filled with lovely, old-fashioned roses, edged with boxwood and contained arbors, trellises and benches for restful enjoyment. The roses and arbor are gone. The boxwood remains though grown out of scale and covered with vines. Adjacent to this is a lovely spot thick with ferns that cries for a planting of wildflowers and other native plants. Though I want to begin developing these areas immediately I'm forced to put them lower on the priority list behind such essentials as a regular mowing schedule for our open areas, trash pick up and removal, brush clearing and routine maintenance, which takes so much of our time and energy right now.

I feel strongly that Awbury's role in the community and the problem of finding ways to best serve and enhance the neighborhood are of primary importance and require immediate attention and response. If the park is to be preserved it must not only meet the needs of the children, adults and institutions in the area but must in return receive their active support. Awbury's major value to the community is simply that it exists. It is 55 acres of

open space in a populous part of the city. It provides a quiet place, pleasing scenery, a habitat for birds and other wildlife and a potentially valuable campus for the study of plants and the natural environment.

To help define more clearly what people living around Awbury want from the park I'm conducting a survey of people using the park and those who live close by. The survey shows which activities people pursue in the park, how many years they've been acquainted with it, how safe they feel in the park and what improvements they would like to see made. By analyzing the data that I receive I am getting a good idea of the make-up of the Awbury public and the level of support they are willing to offer.

Two civic organizations, The East Mount Airy Neighbors and the Awbury Arboretum Neighbors have shown concern for the future development of the Arboretum. The Awbury Neighbors has asked me to speak to their meeting each month about the progress of work in the park, current projects and on general topics of interest in the field of gardening and grounds maintenance. They are using me as a resource person and this adds another arm to the park's educational program. They in turn serve as a source of volunteers and are a support group, which every institution of this sort needs.

People are beginning to realize that Awbury is a precious spot in an area of Philadelphia that needs open space for recreation and passive enjoyment. It serves the community just by its existence but can do so to a much greater extent by increased development of its special features. The park offers so much in its potential for serenity and stability and the chance to offer some loving care and attention in return is a gift.

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Linda Yang's terrace on the 19th floor. Plants are: weeping elm (on left), leaves of sourwood (lower left), last roses (on right).

See page 2.



THE

green scene

HORTICULTURE IN THE DELAWARE VALLEY

JANUARY • FEBRUARY • 1976 $1.00

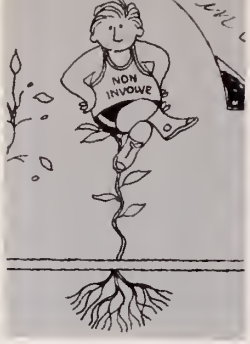
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THE
green scene

HORTICULTURE IN THE DELAWARE VALLEY

Volume 4, Number 3 Jan./Feb. 1976

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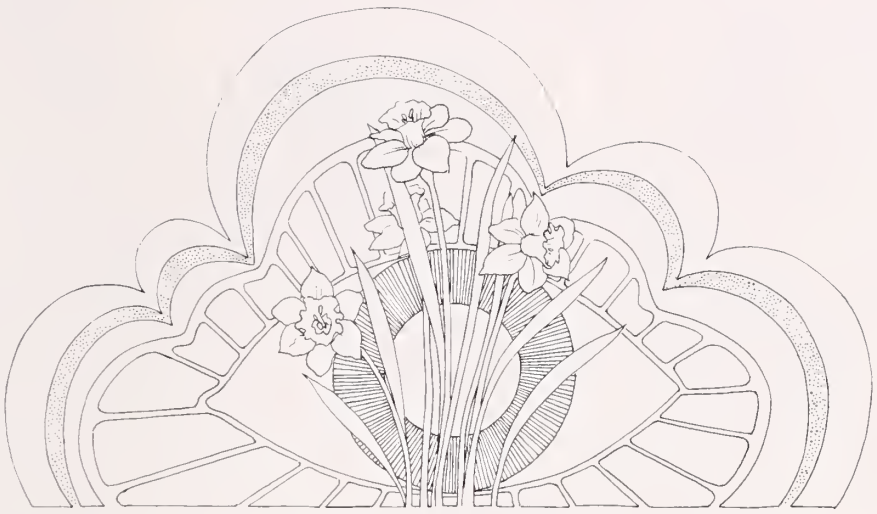
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Front Cover: Kathryn L. Prichard's indoor garden (see story on page 2).
photo by Edmund B. Gilchrist, Jr

Back Cover: A small collection of plants, properly chosen, can yield a surprising number and variety of flowers.
photo by Henry F. Lee



open up your eyes! open up your mind!

We know from the horticultural questions posed to us at the Society that quite a number of people who are interested in plants don't know, or have forgotten, how plants grow. This lack of knowledge poses problems for both the questioner and the answerer. Knowing how plants grow makes it much easier to comprehend the principles of watering, fertilizing, pruning, propagating, potting and repotting and pest control. A person who has even a passing familiarity with plant physiology should have a better garden, or yard, or windowsill with less disappointment and probably less cost simply because she or he understands what is happening.

But that is not the whole story. The current concern, even preoccupation, with beautification, recycling, nature and green things makes the study of the basic botany of seed plants, which most gardeners have experience with, doubly important. Ask yourself, for example, whether you really understand the carbon cycle, the oxygen cycle, photosynthesis, transpiration, how water moves through the soil and how it is taken up by plant roots, the effect of pruning and fertilizing or the basic principles of genetics. If the answer is no, we can only say, in the words of the radio jingle, "Open up your eyes and look around you; there's a great big world you've never seen."

Whatever you do, don't be put off by the notion that the kind of botany we're advocating is difficult to understand or time-consuming to learn. The first principles are easy and fascinating and can be readily absorbed from a simple text available from the library, or, better yet, from Correspondence Course No. 1, *Plant Life*, one of the non-college credit programs in the College of Agriculture of the Pennsylvania State University. ($4.50 by mail from the University, University Park, Pennsylvania 16802.) What better occupation for a gardener during the long evenings of January and February?

Ernesta D. Ballard
President

EDITORIAL



photos by Edmund B. Gilchrist, Jr.

becoming a shrinker

by Kathryn L. Prichard

As a child in northern Minnesota, I roamed at will through forests and fields and on the beaches of Lake of the Woods. I learned to appreciate the different colors and textures of leaves, variations in forms, the beauty of bark, ferns, mosses and lichens.

When I came to Delaware I learned to care for annuals and perennials as a volunteer at the annual Flower Market, and developed a special interest in rock garden plants. When we built our home I had both a perennial bed and a hillside rock garden, my special delight. Beverly Nichols, a British gardening author, once remarked that to really appreciate small plants one had to be a "shrinker," a person who could get down and look at miniatures at their own level. I laughingly remarked to my husband that I had found out what I really was, for I weeded the rock garden on my stomach.

The onset of multiple sclerosis, however, which brings extreme fatigue and poor balance, changed my whole pattern of activity. First the perennial bed gave way to a shrub border. Soon the rock garden required too much maintenance. My gardening was restrict-

Kathryn L. Prichard has not learned horticulture in the classroom; she has learned by doing, through books and by sharing with friends. She has been active in the Brandywine Bonsai Society, the Wilmington Flower Market and several garden and flower arranging groups. She exhibited in the 1975 Philadelphia Flower & Garden Show with the Delaware Valley Chapter of the Indoor Light Gardening Society of America, and her exhibit drew large crowds of interested viewers. Physical limitations prevent her from attending the courses she is interested in, but she continues her studies through the mails and says the PHS lending library keeps her in touch with the latest developments of indoor plant culture.

To the right of the top shelf is a two and a half gallon plastic can (not shown) that lies on its side; it contains a weak fertilizer solution. A long, flexible rubber tube leads from the can down the wall of the cupboard out of a small hole next to and concealed by the garden. The tubing fastens to the watering rod held by the author. A steel spring-loaded lever pinches a piece of gum rubber tubing to shut off the water flow; gentle pressure on the wooden handle starts it. This technique provides selective watering in an environment with many plants with different requirements.

ed to miniature bonsai, annuals in pots, hanging baskets and herbs in a strawberry jar.

Then about two years ago I heard a lecture on gardening indoors under lights. It seemed to be a technique that I could manage by myself. I started with one four-foot fixture, several plastic trays and a few interesting plants; we found the brightened spot in the kitchen-dining area delightful. Shortly the need for more space became obvious. Aesthetics demanded that both lights and trays be concealed. My husband, who enjoys cabinet work, enclosed both reflectors and trays in a birch-plywood shell and concealed the fluorescent lights with plastic eggcrate; I now had an 8-foot open cabinet 18 in. wide and 27 in. high with 5 in. deep trays. Each plant is in its own small pot sunk in dampened sphagnum moss, which provides humidity needed by indoor growing things. Concealing the containers creates the illusion of an outdoor garden.

Now, using natural materials I create a variety of living pictures. A piece of driftwood in the background gives the effect of a weathered tree; the hollow of a geode becomes the home of a maidenhair fern. Important parts of garden design, as in any art form, are repetition and variation. I use a blooming plant to echo the color in foliage of similar tones; then I soften it with ferns of varying shades and textures. A spot of white bloom intensifies the other colors. Open spaces and shadows are as important as plants themselves. With great restraint I have introduced into the landscape some of the accessories I have collected over the years. A carved wooden St. Fiacre, patron saint of gardeners, stands in front of a halo of columnea trained on a wire circle. An enameled golden-crowned kinglet peers into a tiny bird's nest fern; nearby an 'Early Bird' columnea repeats the identical colors of his head. In still another area a large green frog (a replica of a jade museum piece)

continued



Top, l. to r.: *Achimenes tarantella, Podocarpus sp. Oxalis regnelli, Streptocarpus* 'Constant Nymph.' Middle: *Nephrolepsis exaltata bostoniensis* (dwarf); *Begonia rex, Streptocarpus sp., Plectranthus australis.* Bottom: *Sinningia* 'Gary Hunter,' *Pteris ensiformis victoriae, Hoya carnosa variegata.*



Top, l. to r.: *Achimenes tarantella, Vinca major, Punica granatum nana.* **Middle:** *Plectranthus australis, Exacum affine, Pilea microphylla.* **Bottom:** *Pilea* 'Moon Valley,' *Senecio spiculosus, Columnea sp., Sinningia* 'Cindy.'

watches over a small pond surrounded by ferns and bits of driftwood.

A year ago my husband surprised me with a beautiful two-tiered walnut cart for the dining room. Here on the top level I created another scene. Points of interest vary, sometimes a pair of antique bronze Japanese cranes fly in to rest by a small pebbly pool. Soon I will try out a handcarved bluebird that came at Christmas. The lower shelf of the cart is used for overflow plants.

An indoor garden is by no means maintenance-free; I water it several times each week when the pots and moss feel dry, using a very mild fertilizer solution on the plants. They are flushed out monthly with plain water only. This task would be exhausting if it were done with an ordinary watering can. My husband devised an ingenious gravity watering system with a 2½-gallon plastic container placed on the top shelf of a cupboard adjoining my big garden. Flexible tubing and a long watering wand make it possible to reach any area. The walnut cart has a similar system with a water reservoir built in over the top lights and a concealed tube and wand. Daily misting and frequent grooming keep the garden at its peak. Each plant is regularly taken out to check for insects and given a soap and water bath. Working from a wheel chair with one hand creates a special problem, solved by the use of an 18 in. x 6 in. x 1½ in. plastic tray that rests firmly on my lap. In this way four to six plants are transported from garden to sink. I'm glad I'm not charged for mileage. If a plant has outgrown its place, I take cuttings and give the parent plant away. Some plants are permanent residents but seasonal blooming plants from local nurseries provide a constant change in the landscape.

This exciting new form of gardening would have appealed to me if my health were normal. With my limitations it is especially rewarding. My day starts with a quick good-morning checkup to see what changes have taken place overnight. Gardens are promises and memories, a blossom is replaced by a seedpod, a fern frond starts to uncurl. My closeness to the garden makes me more aware of each small change. Friends tell me that it takes a long time to look at my gardens because there are so many little surprises that aren't seen at first glance.

I avidly read everything, soaking up

Overhead parawedge louvers conceal the lights on the walnut cart. The apparatus is chromium covered polystyrene; each square of the grid is made with four parabolic mirrors that prevent scattering the light and direct it downward with greater intensity. The grid is expensive but attractive in an area where lights are visible.

information like a sponge. In the search for knowledge about plant families new to me, I have become a steady customer of the lending library of the Pennsylvania Horticultural Society.

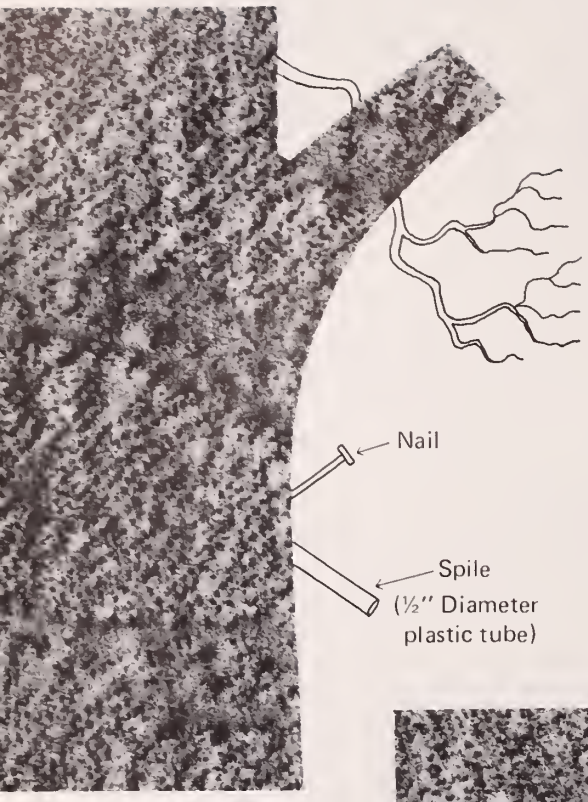
Several indoor garden tours have brought many new people into our home and our lives. We find that gardeners are a special breed who generously share their plants, secrets, ideas, enthusiasms and themselves. It is our pleasure to welcome anyone who is interested in seeing our miniature landscapes. Indoor gardening under lights has provided me with a totally satisfying, consuming and creative interest. I've become a true shrinker, one who really meets plants at their own level.



A full view of the house garden.



THREE LUMPS
or what price



by David G. Boorse

Dave Boorse, thinking that the bicentennial was a good excuse to oppose the tyranny of routine, has taken a year off from teaching high school science to become involved in some other interests including the restoration of a pre-revolutionary inn, writing, and instructing a course in natural science for teachers at the Media campus of Penn State.

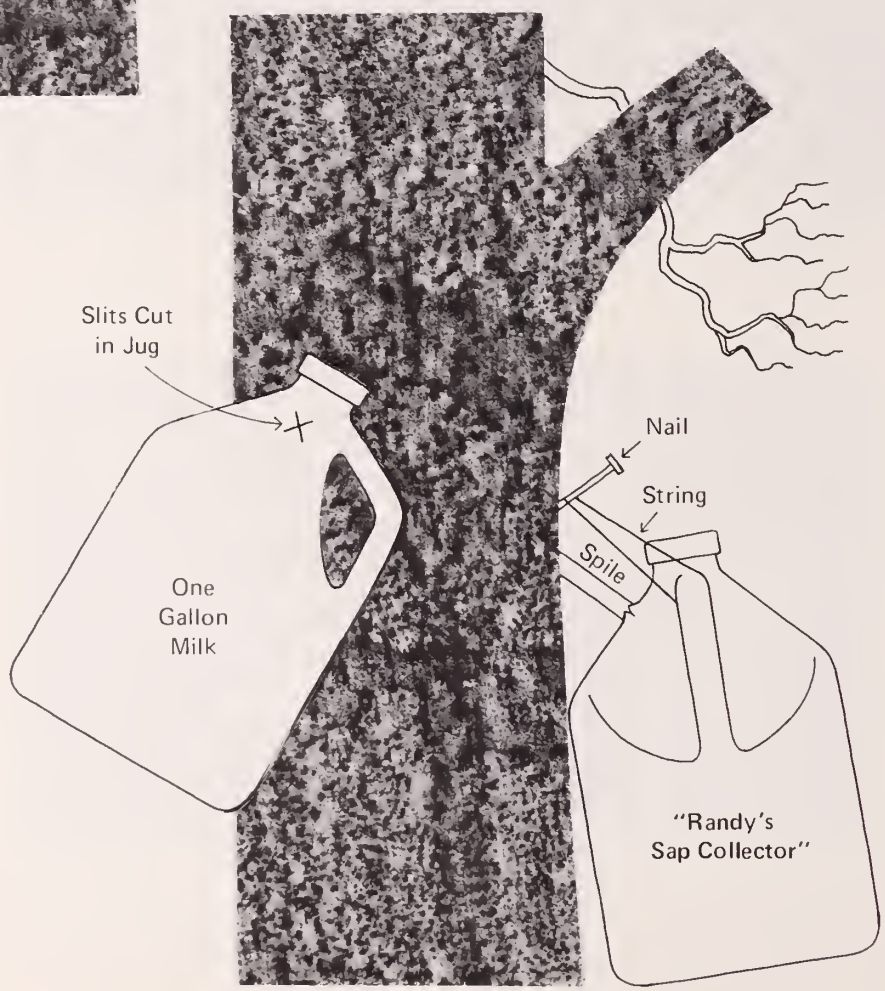
He and Gwen, also a teacher, live in the country where they share their interests in gardening, cooking, and colonial life-styles with their four children.

In our family, the bicentennial spirit of rebellion and pioneering was thrust upon us by none other than the sugar industry. We had just gotten through the oil crisis and were in no mood to be toyed with by sugar interests. The price of sugar was rising steeply in the summer of 1974, and we rebelled. All the wild berries and the juices that were normally made into jelly were frozen for the duration. The use of sugar in canning was curtailed, and we considered a plan of attack. Not a literal attack you understand. A family of six, dressed as Indians, moving along Front Street would be noticed long before they could cast the cargo overboard.

The Old Testament tells us that honey was used as a sweetener several milleniums ago. A perusal of Apicius' *Roman Cookery Book* shows that honey was the only sweetener used in the early years of the Christian era, and a quick glance at the supermarket showed that honey was selling for about twice the cost of granulated sugar per pound. Maple sugar served the colonials very well in time of boycott, but the Indians did not charge as much for it as the Vermonters do now.

Grow our own seemed to be the only solution and our pioneering began. Ignoring Gerard's comments about sugar cane in his sixteenth century *Herbal*:

> *Me selfe did plant some shoots thereof in my garden, and some in Flanders did the like: but the coldnesse of our clymat made an end of mine, and I think the Flemmings will have the like pro-*



FOR THE REVOLUTION
sweetness

fit of their labour,

I planted a short piece of sugar cane that my son had brought me to chew on. I had experienced sugar cane as a child but now I was much more interested in growing it than eating it. It grew very slowly in the greenhouse. When summer came it was set outside where it grew very slowly due to a cool, cloudy summer. Ignoring Gerard is one thing; never ignore Bill Custer! One autumn night an early frost put an untimely end to the entire crop of a single stunted stalk of sugar cane! Somehow, I had known all along it would come to this.

It was too late in the season to start a beehive. Beets would also require a full growing season, and we had not yet heard about making sugar from the juice of watermelons. Maple syrup seemed to be the most likely sweetener we could produce soon. In its favor was the fact that we had tried making maple syrup on a very small scale before with moderate success.

Maple sap is basically a dilute sugar solution with certain minerals and complex organic molecules called esters, which give the finished syrup its characteristic flavor. Maple sap is found in maple trees, naturally, but contrary to common assumption most of the species in the genus *Acer* will produce sugar. We collect sap from our Norway *(A. platinoides),* box elder *(A. negundo),* and red *(A. rubrum)* maples. One of the books in the Rare Book collection at PHS refers to the early use of sap from walnut trees for making sugar.

The two tricks to making syrup are to get the sap and to remove most of the water. Deciduous trees like maple send their sap down into the roots for storage during the fall and winter. The sap begins to flow as the weather warms and late January is the time to collect it. Actually it is still quite cold at nights but the warm afternoons that sometime come in late January stimulate the flow. A number of articles about maple sugaring give March to May as sugaring time but that is too late for the Philadelphia area.

To collect the sap you must (1) drill a hole in the tree, (2) put a spout in the hole, (3) hang a collecting container under the spout. The hole should be approximately ½ in. wide and ¾ in. deep and should be drilled so that it slants upward as it goes in. The exact size is not important, but the spile, which is the correct term for the spout, should fit snugly into the hole or the sap will run out around it and be lost. Traditionalists will want to carve their own spiles out of hollow reeds. We used black plastic pipe ½ in. in diameter because we had it on hand, and it was easy to cut into the 6-in. lengths we needed. The collecting buckets used to be made of wood. Experience showed that metal cans rust. Plastic milk jugs with the top cut off and hung by a string from a nail in the tree did not rust, but did collect bugs and dust making it necessary to filter the sap through a dish towel in the bottom of a spaghetti strainer. A student who came out to lend a hand at collecting time solved the problem by making two short, intersecting slits near the

continued

the politics of sweeteners

At the beginning of the fifteenth century, Venice cornered the market on sugar production and held a virtual monopoly. The price of sugar in England rose from 19 to 24 shillings per dozen pounds. A Fifteenth Century Cookery Boke *lists a number of recipes calling for sugar but by the early sixteenth century only the wealthy could afford sugar for such recipes. At the same time honey was selling for one shilling per gallon. Clearly the peasants used honey to sweeten their food.*

Spain wanted to break the Venice sugar monopoly and sent Columbus to introduce sugar cane to the Caribbean Islands in 1509. Soon sugar plantations were thriving, supplying sugar to Europe and later to the American Colonies.

Napoleon had lots of problems, but running out of sugar due to a blockade is one we seldom hear about. He knew that a German had managed to extract sugar from beet roots so he ordered the French farmers to plant sugar beets.

Meanwhile the plantation owners in the tropical islands were aware of the growing differences between England and her American Thirteen. The plantation owners sided with England in 1775 and were soon boycotted by the colonials. Many of the colonists turned to maple sugar which all of the North Atlantic Indian nations produced. Others turned to the honey that was available from wild honey trees and from some domestic hives.

top of an uncut gallon jug which was hung by string from a nail and the spile pushed through the slits. With a cap on the top of the jug all windborne debris was kept out and only an occasional, adventuresome ant entered the jug.

The second trick in making maple syrup is removing most of the water from the sap. We did that outside in shallow pans over a wood fire in an old iron kitchen range. You need about 40 gallons of sap to make one gallon of syrup, so 39 gallons of water have to be removed. This is done commercially in large shallow trays. Lacking the trays we used large roasting pans and sauce pans. The sap was rotated from one pan to the next. Each time its volume was reduced by about one half until it reached the last pan where it was reduced to the final consistency of maple syrup. As the sugar content becomes greater, the boiling point of the water increases. For this reason the last pan should be watched carefully so that it does not scorch.

Last winter when we tapped the maples, we were living in our country home only on weekends and in a house closer to work during the week. The initial sugaring was done during a break between semesters. After the first week of the new semester we arrived home and found that Dad had collected about 40 gallons of sap, which was sitting around the kitchen in jugs, buckets, jerry cans, basins, dishpans and sauce pans. We had trouble finding something to heat soup in. And there was more sap in the jugs still hanging on the trees. We started that evening using the electric stove in the kitchen. We pretended that electricity was free and boiled our way through Saturday, using most of our bath towels to mop up the lagoons of water that had collected on the window sills. Except that it was a great deal cooler, our farmhouse kitchen looked like a Turkish bath.

When we returned the following weekend, I felt like the Sorcerer's Apprentice. Can maple trees not be turned off? What had started out as a search for an alternative to table sugar took a new direction and became a search for uses of an overabundant sap supply. Sap, right from the tree, was used for brewing tea and cooking vegetables but there is a limit to the amount of tea one can imbibe.

Two practical solutions to the sap surplus were to make canning syrup and vinegar. We normally use a lot of sugar to make a thin syrup for canning fruit. However, by boiling the sap down to a 10:1 or a 16:1 concentration rather than the 40:1 reduction necessary for syrup, we quickly reduced the bulk of sap to a thin syrup that could be bottled in sterilized jars and kept for canning. The jars and lids should both be sterilized very carefully because at this dilution there is not enough sugar to prevent the growth of fermenting bacteria, and more especially because mold should be prevented. Although the labels on commercially sold maple syrup sometimes say that if the syrup gets moldy, don't worry about it, just skim the mold off, recent findings indicate that that is not good practice. Mold toxins can be dangerous, they can permeate the food they are growing on, and the toxins cannot be destroyed by heating or cooking. Preventing mold growth by adequately sterilizing the containers for food storage is an important precaution.

One autumn night an early frost put an untimely end to the entire crop of a single stunted stalk of sugar cane! Somehow, I had known all along it would come to this.

The vinegar idea came when we noticed that a gallon of cider vinegar which had cost 75¢ a couple of years earlier was selling for $1.75. Vinegar *(vin egre*, French for "sour wine") is basically a solution of acetic acid with some esters and is a product of the double fermentation of sugar. Yeasts ferment sugar into alcohol such as hard cider and wine. Certain other yeasts and bacteria can ferment alcohol into acetic acid. Baking yeast may be used for the first fermentation; the second fermentation can be accomplished by collecting some of the sediment from a cask of vinegar and mixing it with hard cider. Since unpasteurized vinegar is hard to come by, however, an alternative method, oxidizing the alcohol by exposure to the air, may be used just as easily. The first step then is the same as in making wine. We used a saccharimeter, an inexpensive device for measuring sugar concentrations available at wine hobby shops, to check the sap as we boiled it down a little until it reached the concentration that would produce the greatest amount of alcohol when fermented. When the sap reached this point, about four and one-half gallons were placed in a five-gallon jug and a small amount of baking yeast was added. The jug was covered with several layers of clean cloth tied securely to keep dust out but to allow air in so the oxygen can oxidize the alcohol as it was produced. The jug sat in a warm place for about five months and at bottling time it smelled and tasted very much like cider vinegar.

I do not know how many people joined our family in making maple syrup to celebrate the 200th anniversary of the colonist's boycott of the sugar industry. It appears that the realization that people of principle will pay twice as much for electricity to make a product as they would have to pay for the product in the store (or they will do without) made the sugar industry capitulate quickly. Soon sugar prices were down to the 1973 level and the frozen fruits and juices were taken out of the freezer and converted to jams and jellies: wild strawberry, sour cherry, red and black raspberry, wineberry, blackberry, chokecherry, peach, pear, and apple. But maple syrup from our own trees was used to can peaches and nectarines.

If you do not have maple trees, let me invite you to join us in planting sugar beets this year to celebrate the 144th anniversary of the founding of the Beet Sugar Society of Philadelphia by James Ronaldson, the first president of the Franklin Institute . . . a Philadelphia first. Oh, yes, if you know how to turn beets into sugar, please give me a call *before* harvest time.

●

20 QUESTIONS

by Ed Lindemann

At PHS we receive many horticultural questions everyday. Most of these questions can be placed into four categories. First and by far the most popular question is "what am I doing wrong," "which spray shall I use" is second, followed by questions about propagation and nomenclature. The following 20 questions are samples of those we receive.

what am I doing wrong?

Since each plant's problem is specific and is the result of its particular environment, it would be impossible for us to print a fair quiz in this category.

Light, temperature, humidity, water and nutrients are essential for all plant growth. Too much or too little or one or more of these factors can cause plant problems. If your plants are suffering check their environmental conditions.

I. which spray to use?

Many people think that they can buy a single house plant or garden aerosol spray that will take care of all of their plant pests; unfortunately they can't. Different problems require different sprays. Before using any insecticide or fungicide be sure to read carefully the directions on the label. Listed below are seven insect or disease problems; can you match the control with the problem?

1. ____ Red spider mites on schefflera (Australian umbrella plant)
2. ____ Scale on chlorophytum (spider plant)
3. ____ Leaf miner on betula and ilex (birch and holly)
4. ____ Japanese beetles on almost everything
5. ____ Black spot on roses
6. ____ White fly
7. ____ Protection for fall and winter transplanted evergreens

Answers

A. Pyrethrum
B. Isotox
C. Benomyl
D. Kelthane
E. Malathion
F. Sevin
G. Anti-desiccant

II. how to propagate it

Most indoor and garden plants propagate easily. Learning to propagate your plants is not only educational and fun, but it enables you to share your special plants with other gardeners as well as an economical way to increase your own collection. Try to match the method of propagation with the variety of plant material listed.

1. ____ *Ceropegia woodi* (rosary vine)
2. ____ *Nephrolepis exaltata* (Boston fern)
3. ____ *Ficus elastica* (rubber plant)
4. ____ *Paeonia sp.* (peony)
5. ____ *Crassula sp.* (jade plant)
6. ____ *Tagetes patula* (French marigold)

Answers:

A. Air layering
B. Runners
C. Division
D. Cuttings
E. Tubers
F. Seed

III. what is the other name?

Gardeners must be able to speak two languages. Everyone who has attempted to find a plant listed has been frustrated at one time or another because they could not remember the botanical name. Listed below are popular plants that are associated with the holiday season. Can you match the common name with the botanical name?

1. ____ Poinsettia
2. ____ Christmas rose
3. ____ English holly
4. ____ Mistletoe
5. ____ Christmas cactus
6. ____ Douglas fir
7. ____ Bayberry

Answers

A. *Ilex aquifolium*
B. *Schlumbergera bridgesi*
C. *Euphorbia pulcherrima*
D. *Viscum album*
E. *Myrica pensylvanica*
F. *Pseudotsuga menziesi*
G. *Helleborus niger*

answers

I.	II.	III.
1. D	1. E	1. C
2. E	2. B	2. G
3. B	3. A	3. A
4. F	4. C	4. D
5. C	5. D	5. B
6. A	6. F	6. F
7. G		7. E

by Alexander L. Crosby

Alexander L. Crosby moved from Manhattan to Bucks County with his wife, Nancy Larrick, in 1960. Both are free-lance writers.

Rocks of Ages... Cleft in Quakertown





photos by author

George Papashvily's sculpture, "Badger," rests on a block of red sandstone at the top of the terrace steps.

There were no rocks at all in the place where I grew up—National City, California—and that may explain why I have loved rocks with something close to passion ever since boyhood. They were always the strange woman, not the girl next door.

The old farm near Quakertown, where my wife and I now live, was richly endowed. The woods had been spared from clearing and cultivation because they were littered with stones weighing from a few pounds to a few tons, the gift of the last glacier in the Pleistocene epoch, more than 2,000,000 years ago. What a heritage!

For 15 years we have been moving as many stones as we could display without seeming ostentatious. The opportunities for placement were great, since the preceding owners had worked for generations to get rid of every stone remaining after the house and barn were built.

Fortunately, they had not toted unwanted rocks great distances. We found some gems in a field close by the barn.

Stones are almost as useful as dirt, and they wear much better. We have used our rocks for these purposes:

1. Stepping stones and steps.
2. A terrace wall.
3. A rock garden.
4. Small bridges.
5. Pedestals for sculpture.
6. Decoration of a pond bank.
7. Erosion control.
8. A bird bath.
9. Shelter for snakes and salamanders.
10. Other things.

For stepping stones, we strive for flatness, thickness, and a reasonably large surface. Some of our stones are 4 or 5 in. thick; once set in place with enough water to make a soupy foundation, they never wobble.

The construction of our terrace wall, up to 4 ft. high, was done by professional masons. They shook their heads over our insistence on a dirt backfill and no mortar (so we could have a scattering of plants on the face) but they built well. I selected the stones from a nearby quarry and ignorantly chose some pieces of solid-looking shale that have been crumbling for a dozen years. Some day we'll have to replace them. Not yet.

The basic rule for a rock garden is to use the same kind of stone. Most of our stones are the same kind, right from the woods, but I could not resist George Papashvily's offer of some rejects from his sculpture studio. For sentimental reasons I took an irregular chunk of quartz from my native Maryland, and there is another stone that will glow under an ultra-violet lamp (which I don't have). Best of all is a stepping stone on which George had etched the outline of an animal he had thought of carving.

We have five stone bridges across a

continued

The rock at lower left went to pieces after being placed in the terrace wall, and the stone above it, at the right, is also breaking up. Quarry stones must be picked with care.



At left: The stone bridge across the inlet to the pond is a Quakertown curbstone, broken in half.

Below: These rocks were trucked in for placement along the bank of the Crosbys' pond.

At right: The bird bath in the rock garden was created accidentally, with dynamite. Behind it is a *Viburnum prunifolium*.





ditch that brings water from the woods to fill our pond. Four of them are beautiful slabs of polished granite (dangerously slippery when wet) from a quarry at French Creek, where I once went with George to get stones for sculpture. These bridges cost 50¢ a square foot in 1968.

The fifth bridge was once a Quakertown curbstone, 17 ft. long, 21 in. wide, and 6 to 9 in. thick. It was a gift from Ray Breiner, the excavator who had improved our pond. This splendid acquisition had to be cut in half so the two pieces could be laid side by side. A stone mason labored for half an hour and did not bite in more than a quarter of an inch. The bulldozer operator watched impatiently. "Let me try something," he finally said. He looped a chain around the far end of the granite and raised it as high as he could. Then he put a large stone on the ground just below the near side of the cut. When he dropped the curbstone on the rock, it broke neatly.

We have several pieces of George Papashvily's animal sculpture, all of them standing on flat stones that are usually of a contrasting color.

Our one-acre pond was not much to look at until John F. Kennedy, a landscape architect, drew a plan for enlarging it and turning 75 ft. into a rocky shore. One of our neighbors wanted to get rid of some sizable boulders. We took 15 truckloads from his field and have been enjoying them for years. So have the eastern painted turtles, the mallard ducks, and the northern water snakes. Kennedy placed the rocks one by one so that they were married to both land and water.

One of our neighbors wanted to get rid of some sizable boulders. We took 15 truckloads from his field and have been enjoying them for years.

There will never be an end to the small and not so small stones we dig from the vegetable garden and from flower and shrubbery beds, but there will always be a place for them: the ditch that carries water from the woods to the pond. They prevent erosion and create sweet music after a heavy rain.

Once, digging in the vegetable garden, my shovel hit rock. I kept digging and uncovered the top and sides of a boulder that had a natural basin on top —perfect for a bird bath. But this stone was too heavy to move without power equipment, and I would have to cut through an expensive fence to make way for a bulldozer.

A couple of years later I found a perfect bird bath, blasted from an even larger boulder in the course of road work next to our property. No wheelbarrow could handle it, but a backhoe carried it to the rock garden. The best view of the bird bath is from my office window, and on warm days I am cheered by watching half a dozen English sparrows, which are either the cleanest or the lousiest birds in Quakertown, fluttering in the water.

Two years ago we got a fine assortment of large stones from a state highway crew that was doing some road-widening. The backhoe man placed

continued



Rock movers are Karen Deuble, Barbara Deuble, and my wife, Nancy Larrick. Propulsion is by crowbar and womanpower.



A sizable rock is the background for pottery mushrooms by Marianna Redd and gentians by Doretta Klaber.

each rock where I wanted it for three groupings along our lane. After adding topsoil and compost, we planted the rock piles with four kinds of local ferns (ebony spleenwort, polypody, Christmas fern, and marginal shield fern), plus scilla, Pushkinia, and chionodoxa. And, of course, moss.

Moving heavy stones is a slow and sometimes risky job. It is done on our place with 2-in. planks, four rollers cut from 2-in. pipe, and an ample supply of women. The rock is raised with pick, crowbar, and female hands to its side. A plank, or a pair of them, is placed alongside for the roll-way. Three or four rollers are put on the roll-way, about a foot apart. The rock is then pushed over to rest on a piece of 2 x 12, which rides upon the rollers. The rollers travel on a track of parallel 2 x 8's.

This fall we moved a stone weighing about 750 pounds from a field to the rock garden. The distance was only 75 feet, but it was upgrade. I used a crowbar in the rear while my wife and two teenage workers, Barbara and Karen Deuble, moved rollers and planks and pushed. The job took an hour and a half.

My wife says that heavy gloves are *de rigueur* for this work. Once she yelled "Stop!" as we were inching a big stone forward. The tip of her glove had been caught beneath a roller. She was able to pull out her hand and the stone rolled across the glove.

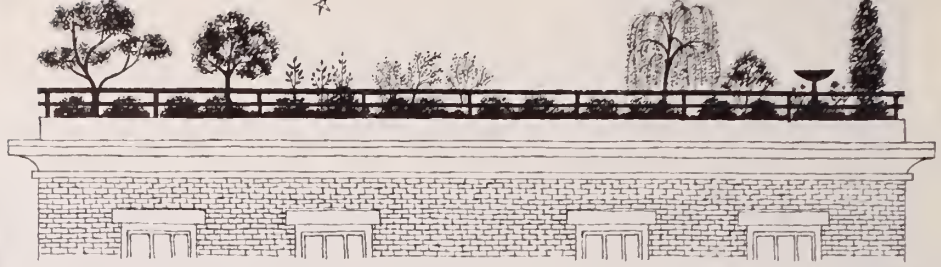
Looking at a big rock I have helped to move and plant is like fondling a roll of $100 bills. Except that the rock will never leave me.

I do not wear gloves but I have avoided perilous positions since the time several years ago when I was overcome by a stone. It was a bulky beauty, a yard long, 10 in. thick, and nearly 2 ft. wide, with a hollow on top that is now enjoyed by polypody and small sedums. Gregg Keyburn, the strongest youth I have ever known, had helped me roll the stone in from the adjoining field. At the rock garden we managed to stand it on end so we could turn it to fall in the right direction. The stone toppled on its own initiative, pinning me on my back beneath it. I was able to gasp, "Get a lever." Ignoring my order, Gregg stooped down and raised one end of the stone high enough for me to squirm out.

Stones weighing up to 300 pounds can be carried easily in a contractor's wheelbarrow. The method is to lay the wheelbarrow in its side and nudge the stone part way in with hands or crowbar. Then one person pulls the wheelbarrow down on the far side while the other worker heaves the stone upward and all the way in.

Nearly everyone—except subdivision residents who desecrate steep banks with a mixture of cobblestones and *Phlox subulata*—knows that stones must be large and partly buried. Looking at a big rock I have helped to move and plant is like fondling a roll of $100 bills. Except that the rock will never leave me.

●



SKY GARDENING

wind sun, stars and . . . traffic

by Ellen V. P. Wells

Ellen Wells received her degree in Landscape Design from the Ambler School of Horticulture of Temple University last month. A former editor of the *Chestnut Hill Local* she has also been a frequent contributor to *Green Scene*.

"How much wood would a woodchuck chuck if a woodchuck could chuck wood?"

Remember that venerable tongue twister? It came to mind when I was pondering, of all things, gardens. My version: "How many beans could there have been if there only had been room?" What I'm driving at is that almost no one today can use the excuse of lack of room for a lack of beans, strawberries or petunias.

And I should know. Moving from the luxury of two acres of grounds and more garden than I could handle to an apartment three stories in the sky and in the center of a business community had me in despair. Gardening had been my therapy, my substitute for The Couch, relief from an emotionally and physically demanding double duty life as editor of a weekly newspaper, and mother and wife.

A sympathetic husband recognized my need to garden as more than superficial and transformed the deep window alcoves of our living and dining area into plant boxes. We soon had daylight filtered through the jungle green of luxuriantly growing house plants. (We also had a healthier, less desiccated atmosphere to breathe.)

My indoor wintertime pangs abated somewhat; spring was not far behind. Lloyd, my husband, agreed that the second story roof, which we overlooked from our bedroom held the potential for a deck, about 12 by 20 ft. of it. (I should mention that we owned the building and lived on the third floor.) Lloyd covered the flat surface of the roof with flooring built of 1 x 2's, set a half-inch apart over a frame. The floor was built in sections so that it could be easily lifted to get to the roof if problems developed, and the boards were spaced for drainage. Fifteen-inch deep planting boxes were topped with a 3-ft. high wooden railing, boxes and railing running around the three open sides of the deck. We planted the boxes with yew, which quickly formed a dense green hedge, offering privacy, and a necessary sense of security and protection from wind. And the deep lustrous green of yew is as nice a backdrop for pots of flowers as one could ask.

Our southeast orientation and 270° exposure, however, provided more sun than was comfortable. Lloyd constructed a simple but effective arbor: two 4 in. x 4 in. posts 7 ft. high were set away from the wall about 6 ft. Two more were stationed against the wall. Light supporting cross members were nailed to the top to hold up strips of webbing available at any hardware store for rebuilding outdoor furniture. The webbing was merely stapled on, and voila! instant shade. We supplemented the webbing with a wisteria vine that shared a plant box with the yew, and which, because of its restricted roots, stayed in bounds and as yet does not seem intent on pulling down the whole apparatus.

We had one freely given gift that would be hard to duplicate—a 365 day-a-year joy. An enormous beech tree had been spared the axe when a parking lot was put in the backyard of our building. The tree envelops the northeast corner of the deck. One could easily fantasize Rimi of *Green Mansions* living among those huge limbs with the squirrels that chase each other tirelessly over its network of squirrel territories. Cardinals, blue jays and finches were welcome visitors even as the trolley cars and buses clanked and fumed below. The beech is a windscreen, noise buffer and pollution filter. It is a color and texture contrast to the yew hedge, and those colors and textures change subtly and deliciously with the seasons.

Our beech gave us that vertical accent without which the deck would have looked unbalanced, like a pretty woman without a front tooth. To balance the beech, we placed a ceramic fireplace in the other corner, the better to cook hamburgers and burn garden trash. It is a good-looking piece of furniture, too, and lends itself to the massing of geraniums and petunias.

Wind is probably the number one enemy of the rooftop gardener, as the story of our handsome ceramic rooster might indicate. He sat perched on a post for several years, noiselessly crowing his head off, until a gust of wind toppled him. Moral: anchor any ornaments doubly well and remember that wind dries out plants quicker than you

will believe. Hanging baskets are especially susceptible to the drying effect of wind.

Wind or not, we found to our infinite pleasure that we had tremendously increased the *sense* of space of our apartment, well beyond the actual additional footage. By turning a bedroom window into a door to gain access to the deck we let more light into the room. To be able to walk outside before bedtime to gawk at the stars or to stretch one's limbs in the pink glow of dawn, and yet still be able to cross the street for a newspaper, an aspirin, a suit at the cleaners or a train to center city, is really having one's cake and eating it.

But the greedy gardener is rarely satisfied with mere perfection. Where are the peas? I wailed. Lloyd responded by knocking together a 4 ft. x 4 ft. x 6 in. box and put it squarely in the middle of our deck. Once filled with dirt (hauled up via pulley in baskets over the railing, as were the yews), it was unmovable, of course, and I was sure nothing would grow in such shallow soil.

As usual the plants fooled me. It proved a dandy bed for lettuce, spinach, radishes and parsley. I grew other herbs in a large strawberry jar: chives, thyme and tarragon. Tomatoes and peppers did fine in large pots, elbowing aside pots of pansies, geranium and petunias.

No grass to mow, no leaves to rake, very little pruning, minimal weeding. But anything grown in pots or boxes requires a great deal of water so access to water is a must. Fortunately for us, we accomplished that without too much difficulty. The problems came later; the water cutoff spigot was in Lloyd's closet. More than once his shoes and ties sprouted botanically interesting molds and fungi from accidental leaks.

Neatness is both as difficult and as essential in a sky garden as it is in any small garden. Storage of gardening equipment and disposal of refuse is a challenge, too. The latter can be nearly eliminated as a problem if one considers a mini-compost pile. Yes, it is quite possible and practical especially if a small screened place is reserved. I used a plastic leaf bag, added water to it every so often and turned it frequently; it became a valuable source of indispensable organic material.

I've had some notable failures as well as successes that I might as well confess to. Morning glories refused to provide a screen for me although I tried them year after year in various exposures and depths of soil. I never could bring spring bulbs to flower. I tried them in the plant boxes in front of the yews before the latter got too large.

I never could bring spring bulbs to flower. I tried them in the plant boxes in front of the yews before the latter got too large. They never appeared.

They never appeared. I tried sinking bulb pots in the vegetable bed and covering them with whatever was available, such as peat moss. They sprang in March and rotted in April. But what did succeed, succeeded admirably. Simple annuals in pots can be moved around for best color arrangement and exposure to sun as well as protection from wind. House plants and coleus thrived all summer in the shade of the dining area provided by the webbing. Chrysanthemums gave splashes of fall color and often wintered over with no help from me.

As the reader may have gathered, I'm back on the ground, away from the noise of police sirens and honking horns, back to looking up at tree canopies instead of into them. My vegetable garden is larger and more prolific, my flower garden includes bulbs and lots of perennials, and morning glories twine easily up a fence. But I've lost my firsthand acquaintance with sunrise and sunset, an inverted bowl of stars and an intimate friendship with a very special *Fagus sylvatica*.

Suddenly, too, I have found a regular asparagus patch of articles and books on penthouse and pot gardening and there are some delightful space-savers I'd love to have tried. Visitors to the 1974 Philadelphia Flower & Garden Show, for example, may have seen the "wall" of wax begonias; a shallow plywood box was filled with peat moss and covered with chicken wire. Begonia seedlings were placed in the holes and the box set vertically. It takes several weeks to cover the wall and if all goes well, no sign of the foundation shows.

One would have to choose plants for a vertical garden with care. Plants that mat or are very compact, like wax begonia, portulaca or sweet alyssum, or trail, such as the trailing kind of lobelia, ivy geranium, or specimen ivy, would be best. Nothing that reaches for the sun too vigorously would do. Watering and feeding chores are doubled, but so is the fun.

Then I've found that lots of vegetables respond well to pot growth. I've seen cucumbers and eggplant and squash started in pots well before the normal growing season all set to produce fruit in June. The tendency of zuccini to get blimp size overnight and to smother everything in the garden is minimized by the restrictions of a pot. And pots (I use light plastic ones that move easily) can be moved around to suit your aesthetic sensibilities as an earthbound plant cannot. More and more growers are now producing dwarf plant material that do more than just fit our smaller gardens. They look better. Witness the slew of new varieties of dwarf tomatoes that look ornamental rather than unkempt, such as Pixie, Patio, Tom Thumb and Presto. The tomatoes are small to medium size, but doubtless bigger ones will be produced as interest grows.

With the right exposure, too, espaliered fruit trees in pots against a wall would be great fun to try. Topiaries lend themselves nicely to small formal settings. One can't have a topiary and eat it too, as I do with my spiraling rosemary.

Among those many books mentioned earlier, an inexpensive paperbound with good pictures and clear type that is simply mindblowing in the possibilities it offers for the rooftop gardener is one called *Raise Vegetables without a Garden* by George "Doc" *[sic]* and Katy Abraham (Countryside Books, $2.95). According to the Abrahams, even corn and asparagus are not out of bounds.

Hey, what *are* we doing with all this land, anyway?

●

SEVEN GARDENS on a quarter acre

by Lillian Hartung

Lillian Hartung writes a weekly column for the Living section of *Today's Spirit,* a daily newspaper published in the Hatboro area. Hartung writes about gardening and other aspects of the good life.



The parking slots keep the rustic look. The woods are to the rear, and behind the railroad ties are daffodils. Impatiens is just beginning to show, and you can also see *Caryopteris sp.* and *Platycodon mariesi.*

photos by author

How much can you plant on a quarter acre? I have seven gardens. In addition, we have a lawn, a sidewalk and a parking area for four cars.

Ours is a corner property and the driveway comes in from the secondary street at a right angle to the front door. Here the saw-tooth parking slots are marked off by railroad ties.

We have planted approximately 65 species of perennials; the big L-shaped perennial bed is on the left in front as you drive in. It has a curved edging of flagstones set on end and raised above the driveway about three inches. The perennials also fill in the triangles in back of the saw-tooth parking. The garden is filled with about 500 annuals each spring.

On either side of the front door is a raised flower bed. Nearest the entrance are two *Taxus cuspidata densa* and at the corners of the house are two *Mahonia aquifolium.* In between are yellow and orange *Azalea mollis,* mixed.

In the back of the perennial garden are shrubs: lilacs, bridal wreath, holly, mock orange, forsythia, tree peonies and caryopteris.

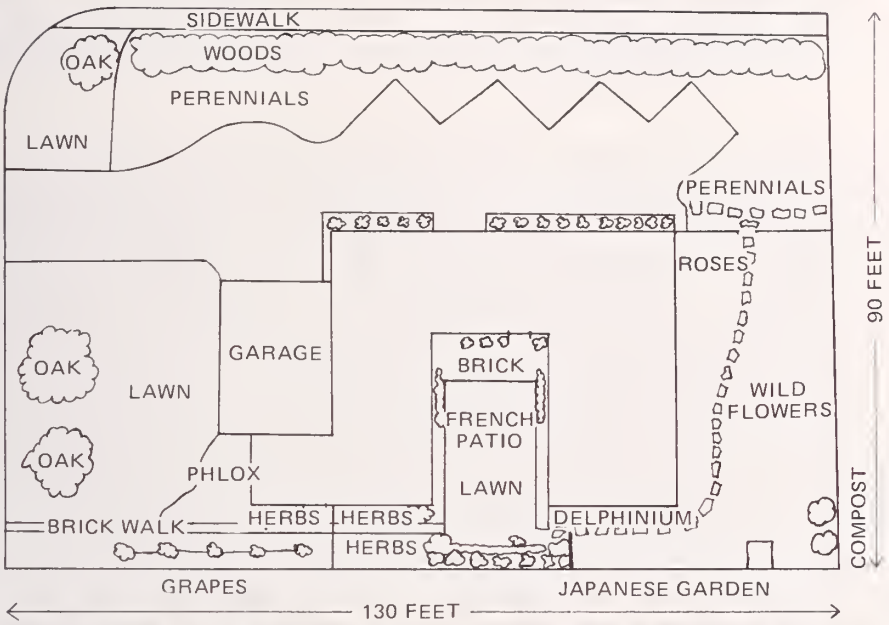
Between the shrubs and the sidewalk is our woods. Woods? What I call our woods is about 6 ft. wide, but it's 110 ft. long. It's shored up with railroad ties and has quite large trees. It's on the north side of the perennials, which is lucky because it protects but doesn't shade the plants.

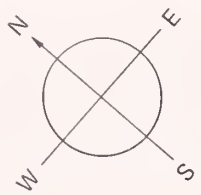
I might be the only gardener in the world who waters woods. The drainage is super-good and watering is the only way to keep the plants alive. Three kinds of fern grow there: polypody,

continued



Here are early perennials with the woods in the background. Echinops, 'Taplow Blue' is in the center with tritoma to its right. On the left you can see the top of the lantana tree, and behind it are two large pots of *Agapanthus Mooreanus*.





The Seven Gardens

1. Woods
2. Perennial
3. Rose
4. Wild Flower
5. French Patio
6. Japanese
7. Herb



This is our woods. You can see how small it is. It lies between the sidewalk and the parking area with the stone steps on the left.

cinnamon and Christmas. Also growing are Jack-in-the-Pulpit, Herb Robert, wild tulip, mertensia, violets, great Solomon's seal, alumroot and trillium. We have laurel and dogwood, too.

The other gardens are fenced in on the east and south sides of the house. Cyclone fence might sound unattractive, but it's great for clematis to climb on. We have about a dozen different varieties and they do well on it. It is also used every summer by heavenly blue morning glories that not only climb the fence but hop over to a drain pipe and on up to the roof. The tomatoes need the fence as do the raspberries, bittersweet and sweet peas. It's a very busy fence.

If you leave the front of the house and go through the gate at the side, you will be in the midst of two more gardens. On the right, next to the house, is the rose garden, not at all formal, with about 50 bushes featuring 'Queen Elizabeth' and 'Europeana.'

On the left, across a dry stream of small boulders that carries off water when we have a surfeit of rain, is a garden of wildflowers. Some we have planted, some are volunteers. We have a low-growing little blue flower whose name I do not know, red clover, buttercups, daisies, Queen Anne's lace, bittersweet, butter-and-eggs, black-eyed Susans, wild bergamot, wild phlox and coneflower.

In the far corner are two large compost heaps and a container for both finished compost and extra soil.

Around the corner of the house you will find raspberries, zinnias, delphinium and a few more clematis. Here there is only 10 ft. between the house and fence. The walk is off center with the delphiniums on the narrow side and the other plants facing them. But we have room for all. The raspberries are espaliered to save space and they really thrive.

Facing you is a bamboo fence about 5 ft. high. It's in two parts that overlap with one part several feet in front of the other so that you can walk through, but not see through. This special fence was made on our dining room table by tying the bamboo pieces together with nylon cord. It has lasted nine years and shows no sign of wearing out.





This is the beginning or end of my Japanese Garden depending on which way you are walking. Like our woods, it is narrow, only 5 ft. wide but 26 ft. long. On the left, completely hiding the cyclone fence is a row of *Thuja elegantissima*. Next to the trees and running parallel to them is our stream. The water enters through the bamboo fence by means of a short fat piece of bamboo and drops to an old-fashioned stone sink. It drops again to the stream and runs on to the pond. Here, of course, it recirculates. The sink weighs about 400 pounds and must be 200 years old. We brought it here from our farm where it originally had been in the kitchen.

Above:
The dry stream runs between the wildflower garden on the right and the path on the left. The rose garden is hidden and is further to the left. Black-eyed Susans are in bloom, and the rose is a yellow 'Sandringham.'

Below:
The Japanese garden looks eastward. The bamboo trees are on the right, front. Water comes in through the fence at the rear and flows past the snow lantern. The stream is well hidden behind the boulders and prostrate cyprus.

At right:
The patio with espaliered pear tree and terrace. In the left foreground are an arborvitae and well-hidden pink wisteria. The small opening in center is a dog door.

Besides the boulders surrounding the stream and pond, we have two prostrate cyprus, a large funkia, and one long-leaved carex. Peering over the fence is an *Arundo donax,* which was planted there to hide the next door garage. A snow lantern stands on pebbles that edge the stream. As you leave the garden you brush past growing bamboo.

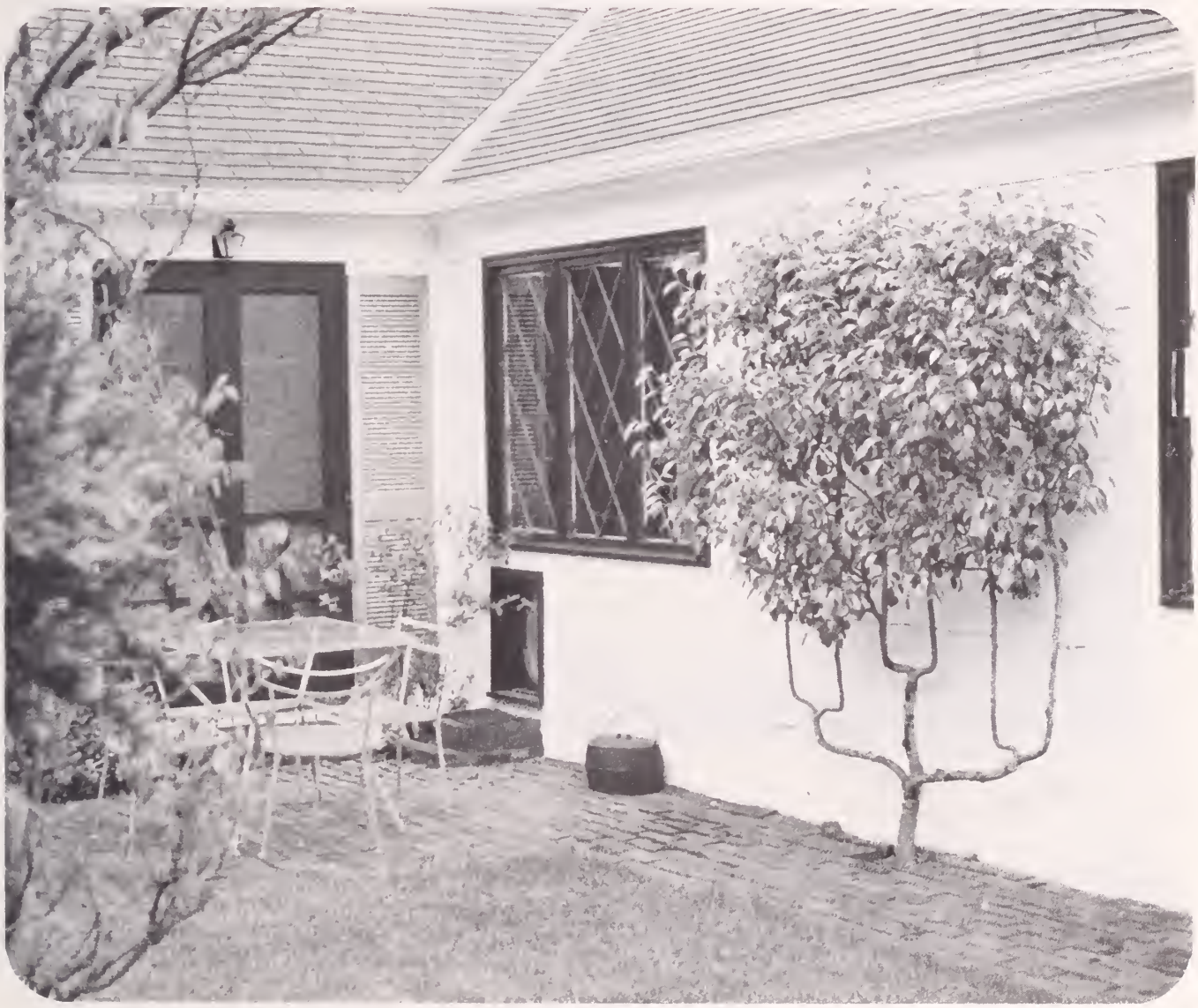
If you turn around, however, you will find yourself in France. This is our patio. It is enclosed on three sides by the house. A brick walk hugs the walls and there is a small terrace in front of the French doors. Fairy roses grow next to the center wall and a chokeberry is in the corner. Two espaliered pear trees hug the side walls and are flanked by pink geraniums in planters. Two bee skeps stand against the house on an old barn beam. A pink wisteria climbs a heavy timber that runs the width of the patio. It and the arborvitae give us the maximum privacy possible.

Walk past the bamboo trees and you will find our last garden: herbs. You can pick thyme, lavender, dill, basil, lovage, tarragon, oregano, horseradish, shallots, parsley, chives, rue, sage and mint. They grow conveniently by the kitchen door.

Now on the left running down to the street is our "vineyard," five grape vines, each one a different variety. On this side of the house (west) is the lawn where children of the neighborhood can sit in the shade of young oak trees.

One does not need a large estate to have more than one garden. We accomplished what we did on an average suburban lot. It is just nine years old and every year it improves. It just grows and grows and grows.

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USING CACTI AND SUCCULENTS IN DISH GARDENS



photo by Henry F. Lee

Figure 1. *Notocactus crassigibbus.* The purist may choose to grow each plant in a separate container.

by Henry F. Lee

Henry F. Lee is a pediatrician who raises cacti and succulents as an avocation. In addition to his practice, he is an associate professor of pediatrics at the University of Pennsylvania.

Cacti and other succulents are generally recognized as good subjects for dish gardens. As with other horticultural material, such plantings may be attractive or just plain ugly.

Choosing a pot, dish or other container is entirely a matter of personal preference. The purist may wish to grow each plant separately in order to develop the best possible specimens but cacti will grow well in very close quarters.

For dish gardens with several plants of different varieties I favor simply styled containers of subdued color and line. However, blending the dish and plant into a pleasing arrangement is where the artistry comes in. The bonsai dishes are hard to beat. Their proportions are generally excellent and their simplicity of line and surface does not detract from the planting.

The most basic rule in selecting a container is good drainage. If you are truly experienced you can grow even the most difficult and demanding desert plants in glazed containers without drainage holes, but I don't advise it. It will double the work you have to do.

Choosing cacti for the dish gardens takes a lot of thought and experimenting. Cacti run the gamut in shape from tall and slender as a pencil to almost as round as a baseball (see box). Their skins may be soft and satiny or so covered with coarse spines as to be invisible. Skin color varies from lightest green (Figure 2) to dark purple-brown; spine color from purest white through bright yellow to deep red.

It's best to arrange your plants so that the taller growing types are behind the shorter and with a mental image of the symmetry or asymmetry you would like to achieve as they grow. Usually a planting that is to be a longtime guest is started with plants that are younger and smaller than the end result we want. As they grow, they will accommodate to one another and blend naturally with one another. Lacking this period of growing together plants tend to look merely "stuck in."

How do you judge growth rate and likely ultimate size? Books or your own experience will help. It is also possible to control growth to a large degree without damaging form, color or even potential flowering.



photo by Edmund B. Gilchrist, Jr

Figure 2. Although this is a black and white photograph, variations in skin colors are clearly discernible; the range is from light green to dark purple-brown.



photo by Henry F. Lee

Figure 3. Various lithops.



photo by Henry F. Lee

Figure 4. *Busera microphylla.* A young busera may be kept for years in a single container, pruned and framed to suit.

controlling growth of mixed plantings

The greatest single problem in dish gardening is controlling growth. Five factors play important roles in the rate and type of plant growth: soil, light, heat, water and available food.

Plants requiring especially good drainage or exceptionally dry conditions such as lithops, nananthus, titanopsis among the succulents, or mamillopsis, ariocarpus or oroya among the cacti can thus be accommodated. Planted in the thinned out soil they get the extra drainage they require. Since such plants also need less water than most, it is then possible to control their moisture supply by spot-watering other plants in the dish and letting the special "dry" plants get theirs by the capillarity of the soil alone.

Light: At all times you can give as much light as possible short of actual sunburn, which can happen under glass in direct sun in greenhouses. Using fluorescent lights I find a tube-to-plant distance of about 14 in. to 18 in. works best. With Gro-lux tubes I give 14 to 18 hours of light a day. If you are using a sunny window turn your dishes every few days. If plants are budded forget the turning until after flowering. Some varieties will not open their buds, or will drop them, if the direction of light changes abruptly.

Heat: Household temperatures are usually fine and during the winter the lack of humidity suits desert plantings well. Heat and water together will usually start growth but these plants can stand plenty of heat without growth if kept on the dry side. Also, when dry, most of them can stand temperatures as low as 40° without damage. Water and temperature must always be considered together. Generally, water plus cold means rot; water plus heat means growth. Dryness plus either heat or cold keeps things at a relative standstill although excessive heat may bring some linear growth at the expense of water stored in the plant with loss of "fatness" or tissue turgor.

Soil: A standard cactus potting mixture serves well for almost all the plants to be used. To avoid rapid, soft growth, it is essential that the mixture not be too rich. I use:

1 part ordinary garden soil
1 part coarse builder's sand (not sea sand)
1 part finely ground or sifted leaf mold
1 teaspoon bone meal per quart of mix
(Stir in extra sand or perlite for plants requiring extra good drainage or extra dry conditions)

A satisfactory substitute that may be even easier for you is ½ African violet soil (available in garden stores) and ½ coarse sand plus the bone meal.

Sometimes, if I wish to include a plant with special requirements, I add extra perlite or sand or finely crushed stone by stirring it into the regular mix in that part of the container where the special plant is to go.

Water: All plants require water, and cacti are no exception. If we are to see them at their best, judicious watering is as important as any other factor in their care. I always emphasize to beginners that the mere fact that they can exist without water for long periods does not mean that they can do so and appear at their best. However, in our planters, "being at their best" does not mean producing a specimen plant of maximum size. Therefore water is used to produce only the growth wanted and to keep the plants healthy.

It is impossible to give absolute rules about watering. Need varies greatly with type of plant, size of container, external heat and humidity and type of growth desired. If the plant is already the size you want and does not appear shriveled you can safely withhold water.

Fertilizer: Dish gardens, in general,

continued



photo by Edmund B. Gilchrist, Jr

Figure 5. Spine colors are often distinct; these range from purest white through bright yellow to deep red.

need no nutrients beyond what the compost can supply. In the early stages of a new planting when you want some growth, dilute fertilizers can be sparingly used. African violet fertilizer diluted to 1/3 the recommended strength will do. Later, if you are aiming at flowering some of the plants, a few widely spaced applications of fertilizer in the three to four month period before the flowering season may be needed. Using a baster you can spot-fertilize or spot-water a particular plant or group. Moderation is the rule with fertilizers. You don't want an adolescent growth spurt in your well-balanced work of art.

When you've selected your container, cover the drainage holes with an irregular crock or stone, add your soil mix to half its depth and place your plants. Spread their roots the best you can, add mix to near the level you want and top off with coarse gravel, crushed stone or any other very porous material you desire. Avoid fine sand because it tends to cake and to promote rot at the base of plants.

Study your plants as they grow. See them as individuals as well as a group. If you need a little extra growth here or there, do a little spot-watering. If, when spring and longer, brighter days arrive, you find everything in good balance you may water more freely. A face washing with a good pressure mister will wash away winter's dust and brighten up the plants. Do it on a bright day. With recent plantings, those done during the current winter, I sometimes stand the whole container in room-temperature water up to half its depth to give roots a good soaking, but I would never, never do that in cool dark weather.

Pay attention and your plants will provide a long period of aesthetic satisfaction. Keep them under lights or on their windowsill or in their greenhouse when there is no one to see. Display them proudly when you have guests. If you have planned well they will draw comment and praise and who does not enjoy that?

where to buy

You can find many attractive cacti and succulents in local garden centers and plant shops. Having done so you may be "hooked" by these fascinating plants. You may wish to explore further among the hundreds of interesting types. There are many fine nurseries. Those listed below are real specialists, ship clean healthy plants and, between them, will have most all the varieties I have listed plus many, many more.

(Fine cacti and succulents have to be carefully prepared for shipment. It takes a bit of time. Allow two to four weeks for shipment.)

Ed Storms
4223 Pershing
Fort Worth, Texas 76107

(Catalog 25¢; succulents only; fine collection — rare South Africans.)

Kirkpatricks
27785 DeAnza St.
Barstow, Calif. 92311

(Many of the fine and less common varieties. Ask for latest list; include 10¢ stamp.)

Grigsby Cactus Gardens
2354 Bella Vista Drive
Vista, Calif. 92083

(50¢ for fine catalog; specialize in fine specimen plants also.)

Henriettas Nursery
1345 N. Brawley
Fresno, Calif. 93705

(A very large selection of the common and not so common. 20¢ for large catalog.)

recommended books

Cacti and Succulents, A Practical Handbook by Walter Haage. Broad scope, beautifully illustrated.

Succulents and Cactus by Jack Kramer.

Both the above and many others available from:

Abbey Garden Press
1593 Los Canoas Road
Santa Barbara, Calif. 93105

Send for their book list.

Also *Decorative Cacti: A Guide to Succulent House Plants* by Rudolph Subik and Jirina Kaplicka, Hamlin Publishing Group Ltd., N.Y.

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a choice selection of fine plants for dish gardens

(Note: In general these are not the commonplace cacti and succulents. The nurseries listed can supply most of them. The pursuit of the strange and the beautiful is part of the game!)

A. Varieties Heavily Covered with Spines or Hair or Both

	White Spines (s) or Hair (h)	Red Spines (r) or Black (b) with wool (ww)	Yellow Spines
Tall	*Espostoa lanata* (h) *Cleistocactus strausi* (s) *Oreocereus celsianus* (h & s) *Cephalocereus senilis* (h)	*Eulychnia* 'St. Pieana' (b) (ww) *Myrtillocactus geometrizans* (black sp., blue)	*Haageocereus chrysacanthus* *Trichocereus candicans* *Cleistocactus tominensis*
Medium	*Espostoa melanostele* (h) *Mammillaria klissingiana* (s) *Mammillaria geminispina* (s) *Mammillaria bombycina* (s)	*Ferocactus peninsulae* *Tephrocactus molinensis*	*Mammillaria elongata* *Parodia aureispina* *Notocactus magnificus*
Short	*Mammillaria candida* (s) *Mammillaria parkinsoni* (s) *Mammillaria neopotosina* (s) *Mammillaria hahniana* (h) *Mammillaria schwartziana* (h) *Mammillaria plumosa* (soft s) *Notocactus haselbergi* (s) *Rebutia muscula* (s)	Thelocactus bicolor (r & w) *Ferocactus acanthodes* (r) *Ferocactus gracilis* (r) *Ferocactus pringlei* (r)	*Mammillaria nivosa* *Thelocactus roseanus* *Mammillaria elongata* (crest)

B. With Sparse or Absent Spines but Fine Color or Shape: Other Succulents (o)

	Green	Brown or Red-brown	Gray or Silver	Dark Brown or Purple
Tall	*Aloe variegata* (o) *Euphorbia grandicornis* (o) *Opuntia microdasys* *Cereus peruvianus monstrosus*		Hoodia, various (o) *Cotyledon undulata* (o)	*Setiechinopsis mirabilis*
Medium	*Sedum multiceps* (o) *Faucaria* (o) *Crassula* 'Moonglow' (o) *Aloe haworthioides* (o) Astrophytum, various *Mammillaria camptotricha*	*Notocactus rutilans* Neoporteria, various	*Schwantesia triebneri* (o)	*Neoporteria nigrohorrida*
Short	*Haworthia leightoniae* (o) *Haworthia planifolia* (o) *Haworthia truncata* (o) *Euphorbia obesa* (o) *Notocactus crassigibbus* *Lithops lesliei* (o) *Pleiospilos neli* (o) *Submatucana madisonorum* *Crassula teres* (o) *Gymnocalycium denudatum* *Obregonia denegri* *Gymnocalycium bruchi*	*Gymnocalycium mihanovicmi* var. *frederickі* *Gymnocalycium delaeti* Lithops, various *Haworthia truncata*	Dinteranthus (o) *Gymnocalycium asterias* *Astrophytum asterias* *Gymnocalycium tricantha* *Gymnocalycium cardenesi* *Titanopsis*, various (o) *Lapidaria margaretae* (o)	*Sulcorebutia rauschi*

by George H. Manaker

George H. Manaker is associate professor and chairman of the Department of Horticulture and Landscape Design at the Ambler Campus of Temple University. He is greatly interested in plant regulators and their use in modifying growth and development. Manaker has conducted research with growth retardants and gibberellic acid and their influences on plant anatomy.

plant growth regulators

Plants do not grow all the time, nor when active do they grow at a uniform rate. Externally, water, temperature and light profoundly influence growth patterns. But an internal chemical mechanism regulates and coordinates the process. The chemicals, called growth regulators, are organic materials, which in small amounts encourage, stop or otherwise modify growth. If synthesized by the plant itself, they are called hormones; if manufactured they are called "growth regulators." The term "growth regulator" is now used to describe both the naturally occurring hormone and the manufactured product.

Scientists have been interested in the possibility of chemical growth regulators since the 17th century, but it was not until after the first quarter of the 20th century that the first growth chemical was isolated.

Today, we know about a great many growth regulators. The two major categories of regulators are involvement and non-involvement chemicals. Involvement chemicals are directly associated with the metabolic pathways essential to growth;they control growth by interfering with a process. The non-involvement chemicals are directly toxic and are used to deliberately kill specific tissue in the plant.

involvement chemicals:

Involvement chemicals include auxins, gibberellins, cytokinins, ethylene, abscisic acid, growth inhibitors, and growth retardants. Non-involvement regulators include chemicals that may act as emasculating, disbudding and pruning agents.

Auxin (indole-3-acetic acid or IAA) was the first recognized growth regulator. Called by some the "master hormone," it is synthesized in the meristematic stem tips and expanding leaves. It regulates growth in a number of ways.

Primarily, auxin promotes straight growth by fostering cell elongation in stems, leaves, flower pedicels and roots. All hormonal control is exerted by concentrations of the material in the cell; the same concentration may have different effects during different phases of growth and in different plant organs. For example, concentrations of IAA that promote straight growth in stems inhibit it in roots.

Auxin is also responsible for phototropism, a plant's bending toward the light; higher IAA concentrations on the dark side cause greater elongation of these cells and the movement toward the light. Geotropism, the response to gravity with roots growing down and stems growing up, is also a response of different concentrations of auxin.

In many plants, IAA prevents natural branching by inhibiting growth of lateral buds, a condition called apical dominance. Sunflowers have strong apical dominance and grow with a single stem, while tomatoes exhibit little apical dominance and produce numerous side shoots. Branching in many plants may be promoted by removal of the stem tips because pinching removes the sites of auxin synthesis, hence the inhibitor, enabling lateral buds to grow. Consider the density of a frequently-trimmed privet hedge compared with one left unpruned. Auxin may also promote root initiation, fruit development, cambial activity. It inhibits leaf and fruit drop, and flower initiation.

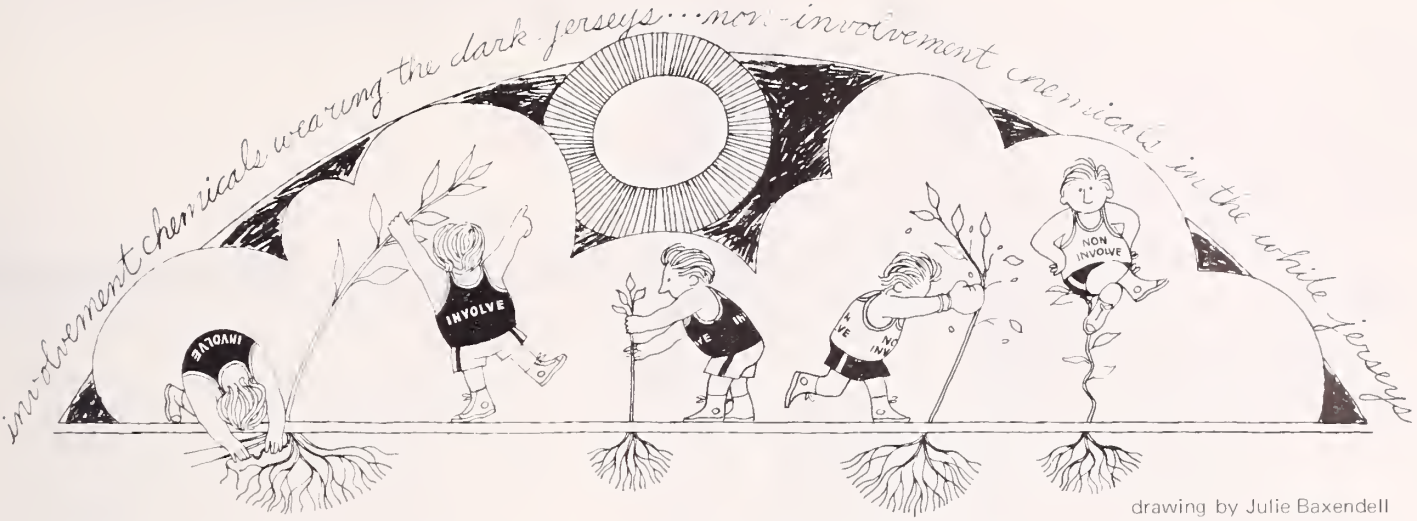
Many synthetic auxins have been developed and are used widely in horticulture. Root-inducing materials have an auxin base as do materials used to set or thin fruit. 2,4-D is one of many synthetic auxins which at high concentrations acts as a herbicide. Auxin-based regulators are readily available to home gardeners at local garden centers.

Over the last four decades, more than 37 different **gibberellins** have been isolated and identified. They may be found in most plants. GA_3, the most common, is known as gibberellic acid. Gibberellins are synthesized at sites of active cell division and stimulate many plant processes. They are also used to counteract processes that slow or arrest plant growth. GA induces cell elongation by promoting both cell division and enlargement so that GA treated plants are taller, with larger leaves and inflorescences than untreated plants.

Gibberellins induce biennials to flower the first year, induce long-day plants to flower in short days, end dormancy in buds and seeds, and substitute for light in the germination of light-sensitive seeds such as lettuce. GA also causes parthenocarpy, the development of fruit without fertilization. Commercial preparations of GA are available at garden supply stores and one might want to experiment at home.

Cytokinins, first identified in 1956, are primary influencers of cell division and differentiation. Cytokinins have numerous other effects on plant growth including inhibition of leaf aging, and the promotion of leaf enlargement, stem elongation, and germination of light-sensitive seed.

Abscisic acid (ABA), sometimes referred to as **dormin**, is produced in the



drawing by Julie Baxendell

leaves, and promotes dormancy, petiole abscission (leaf drop) and aging. Dormancy enables a plant to survive during adverse periods such as winter or droughts. It's still not clear how dormancy works, but we do know that abscisic acid is just one of the triggering processes that prepares plants for survival. ABA may also prevent germination of seeds while still in the fruit.

Ethylene (C_2H_4) was recognized as a naturally occurring growth regulator in 1970 and is the only one that is a gas. At low concentrations, ethylene will cause abscission (drop) of leaves, flowers, young fruit and other organs. It is a product of ripening fruit, and hastens that process. Rapid aging is a characteristic response to ethylene exposure.

Commercially, ethylene or ethylene producing materials are used to degreen citrus, induce flowering in pineapples, and promote more female flowers in cucumbers.

Epinasty, downward bending of leaves, is a common response to this hormone. Tomatoes show an epinastic response very readily, and are excellent indicators of low concentrations of this gas. Gas companies at one time relied on this response in tomatoes or marigolds to locate gas leaks.

Ethylene-generating fruits and vegetables such as apples and lettuce will injure flowers if stored together. The ethylene produced by an apple placed on the leafcup of a bromeliad causes floral initiation in these relatives of the pineapple.

Growth inhibitors are found in all plants at every stage of development. Inhibitors totally suppress growth and may cause distortions and malformations. Inhibitors prevent germination of a seed while it is in the fruit and prevent dormant seed and buds from growing. **Maleic hydrazide**, a synthetic growth inhibitor, stops cell division in stems. It is sold commerically as a spray for lawns; supposedly it suppresses cell division at the growing point and therefore keeps the grass from growing.

Growth retardants are a class of compounds that do not totally suppress growth, but rather reduce stem elongation. They may be used to scale responsive plants to size, as with poinsettia, potted chrysanthemums, and many annuals. In addition to reducing internode length, thereby producing shorter stems, treated plants have darker-green, thicker leaves, and thicker stems. They may also better resist drought, heat and salt and are less sensitive to air-pollution injury. Retardants have been used to enhance rooting of cuttings, reduce storage problems of fruit, and promote flower initiation. Their use may delay flower development, however.

The first growth retardant was used about 25 years ago. Few species responded so it had limited application. Newer materials are effective on a wide range of plants including woody and flowering ornamentals, fruit and vegetables. One, Phosphon, is available for use by home gardeners, and effectively reduces the height of chrysanthemums. The other materials include Chlormequat (Cycocel, CCC), SADH (B-9, Alar) and Ancymidol (A-Rest) and are available from greenhouse supply firms, for those who wish to experiment.

non-involvement chemicals:

Non-involvement growth regulators influence plants in physical rather than metabolic ways. Chemical pinchers are used effectively on azaleas where they kill the cells at the tip of the stem by destroying certain membranes. Such killing eliminates the apical dominance caused by auxin, thereby promoting branching.

Chemical disbudders will selectively kill axillary (side) buds producing a stem with one single flower as in standard chrysanthemums. The process eliminates the need for hand removal of side growth.

The chemical growth regulators work separately and interact with each other and with all the other constituents of the cell and the external environment to control and regulate plant growth. For example, several of the growth retardants seem to act by interfering with GA and/or auxin metabolism, and their effects may be overcome by GA treatment. They are an important area of research for the scientist and a tool for the horticulturist. Their use is becoming increasingly important. If you want to explore the subject further, I recommend the books listed in the box accompanying this article.

Audus, L. J. *Plant Growth Substances.* Vol. I, *Chemistry and Physiology.* Barnes and Noble Books. New York, 1972.

Butler, J. D. *Plant Regulators: Their Use as a Hobby.* Univ. of Ill., Cooperative Ext. Service. Circ 886, 1973.

Cathey, Henry M. "Physiology of Growth Regulating Compounds," *Annual Review of Plant Physiology,* 15: 271-302, 1964.

Weaver, Robert J. *Plant Growth Substances in Agriculture.* W. H. Freeman and Co. San Francisco, 1972.



The Seeds of

AMERICAN BOOKS ON

Gardening, botany, agriculture and medicine all have a literature of their own. Specialization, however, developed rather recently, and it is interesting to look back to colonial times and to trace the rise of books on these subjects. Loosely, the order of specialization developed from herbals to agriculture to botany and finally to horticulture.

American colonists studied plants chiefly for their value as food or medicine. Herbals, books dealing primarily with the medicinal properties of plants, were the main source of information about any growing thing. Botany, gardening and medical science were still much confused and were but part of natural science, which indiscriminately studied birds, beasts, men and plants. It is only in the last hundred years that natural history and botany have become distinct from the general study of medicine. Harvard classified them as separate scientific courses in 1840.

It was many years before the colonists began to produce books of their own. Printing was difficult. Few presses existed because the Crown, for political reasons, wanted as little private printing as possible. Even so the colonies compare very favorably with the mother country; Boston had its printing press in 1638 and Glasgow had one only a year earlier; Manchester, Liverpool and Virginia (the second colony to have a press) were almost a hundred years later. Where presses did exist they printed chiefly almanacs, legal, religious and political books.

Making paper was a great problem. Rags were necessary and the supply was inadequate. Consequently, the early books are small with narrow margins; the paper quality was poor and did not take the ink well. Books did not improve until almost 1830. Until then

by Emily Read Cheston

American Horticulture

AGRICULTURE, BOTANY AND GARDENING PUBLISHED BEFORE 1850

most of the books were decidedly scrubby looking. There was little fine printing or book making in this country before 1850.

Incentive to good printing was not helped by the fact that ambitious colonial authors often sent their works to England or continental presses where magnificent work in type, paper, colorplates and binding was being freely produced. Not only was a handsome book to be expected but authors hoped to gain a larger circulation amongst English readers, who, at that time, were interested in all foreign countries, as well as in growing things and natural history.

The colonies did import great numbers of books and, for a long time, simply accepted the English supply. Toward the end of the eighteenth century, however, a few agricultural books were printed in this country. These were apt to include the name of the state or locality in which they were written, for example, *The Carolina Florist* or *The Pennsylvania Farmer*. As the Revolution approached, national consciousness grew and the word "American" was frequently used. The regional books printed lists of subscribers proving that the circulation of any one book was limited.

For example, the first *American Herbal* was published in Walpole, New Hampshire, in 1801. The list of subscribers was drawn entirely from New Hampshire, Vermont and Massachusetts, most of them being rural—only a very few coming from Boston. It is a delightful little book where anything that could, and many things that could not, be used medicinally are listed alphabetically so that crystals is followed by cucumber and clover by coal-mines and cob-webs.

agriculture

In 1803, *A Treatise on Practical Farming* was published in Maryland. The author, Binns, was a tobacco farmer who had many ideas about improving the fertility of the land by using gypsum, clover and deep plowing. Binns had watched land become so exhausted by successive crops of tobacco that it had to be abandoned. As early as 1794 he had used gypsum on his fields and continued to experiment and to record the results with great care and detail. The country benefited much by his work, and Thomas Jefferson wrote of it to his English friends.

Most of these early books are agricultural in the strictest sense; there are few references to cattle or even to bees although at this time there were many French and English works on this subject. Flax is a constant source of interest and many authors speak of silkworms. Tobacco is mentioned cursorily but the three outstanding topics are vines and wine-making, apples and lime, which is often called gypsum or landplaster.

The demand for a Board of Agriculture crops up. Washington, in his farewell address to Congress, expressed the need of such a department; yet in 1861, agriculture was still under the Commissioner of Patents. The Commissioner in no uncertain terms reiterates the need for a Secretary of Agriculture declaring that in its present subordinate position the department seemed designed mainly "to furnish cuttings and garden seeds to members of Congress and to supply exotics for their greenhouses and pleasure-grounds." This plea was evidently effective, because a Department of Agriculture was created the following year and published its first report in 1862. It is interesting that both in 1861 and 62, flax and vines

continued



for wine-making are still prominent topics.

botany

The early botanical books were largely concentrated in one locality — Philadelphia — and have, therefore, a definite relation to each other. The first one indigenous to this country was Humphry Marshall's *Arbustrum Americanum* published in Philadelphia in 1785. It lists alphabetically American trees classified by the Linnaean system. The title page says that the descriptions are plain, simple and familiar and that the author has included "some hints as to uses in medicine, dyes and domestic economy." Humphry Marshall, like Bartram, studied and collected plants in this country and shipped them abroad to English patrons. Marshall must have been largely self-educated because he left school at the age of twelve. He was an astronomer as well as a botanist, built his own house and also a greenhouse.

Dr. B. S. Barton, a teacher at the University of Pennsylvania, wrote the first true botanical textbook. His *Elements of Botany,* published in 1803, was widely read in this country and was also translated into Russian. Besides his work in botany, Dr. Barton wrote on sundry and various topics such as the "Fascinating Faculties" ascribed to rattlesnakes, archaeology, and Indian customs and history.

Thomas Nuttall, a Yorkshire printer working in Philadelphia, became interested in botany through a chance acquaintance with Dr. Barton. Nuttall was an accurate observer and indefatigably energetic, going on plant hunting expeditions to Florida, the Great Lakes, Kansas, the Columbia River and twice to the Hawaiian Islands. He taught at Harvard and wrote on minerals and birds as well as on plants, and had the economical habit of being his own printer. His two outstanding works are the *Genera of North American Plants* published in 1818 and the three supplementary volumes of Michaux's *Sylva* — published in 1842-54.

Constantine Samuel Rafinesque, who died in 1840, was an erratic foreigner who came to this country in 1822. Vain, ambitious and eccentric, he was also "one of the pioneer naturalists of the United States." He was eager to find new plants and took long trips alone and on foot in various parts of the country, once walking over 1,200 miles in a year. His voluminous writings are chiefly botanical but he also wrote on minerals, fish, grape-culture, whaling, incombustible houses and boats and *The Genius and Spirit of the Hebrew Bible.* Always certain that his work was being slighted, he was restless and hard to work with and it was a long time before the value of his contributions to botany was fully realized. Outstanding among his many writings is *Medical Flora or Manual of Medical Botany in the United States of North America,* published in 1828, and illustrated with crude wood-cuts of the author's own drawings. Rafinesque had studied the Indians' use of plants and many of their remedies and practices are embodied in his text.

It contains concrete examples and remedies and relates the sad plight of a gentleman of title who, having indulged too freely on watercress, found himself to be the unhappy container of many live toads.

Medical botanies were regarded as valuable household reference books. It is hard to believe that they were helpful in illness as they tend to deal in botanical particulars but medical generalities. Few of them were as specific as Peter Good's *The Family Flora and Materia Medica* published in 1845. It contains concrete examples and remedies and relates the sad plight of a gentleman of title who, having indulged too freely on watercress, found himself to be the unhappy container of many live toads.

Up until the death of Rafinesque, the outstanding botanists had all been connected with Philadelphia, but the next important name is that of John Torrey of New York. Torrey's father, who had fought in the Revolution, became fiscal agent of the New York State prison. When John Torrey was about 15 years old, a naturalist, Amos Eaton, was imprisoned for debt; unable to continue collecting, he was glad to have the boy bring him specimens from the surrounding country. Eaton was enthusiastic, and in his *Manual of Botany* published in 1818, fully acknowledged Torrey's help. Thus began Torrey's work in botany and in science, for he was also interested in minerals and chemistry and at one time taught at West Point. He was a careful student, his work was thorough and complete. He became botanist of the state of New York, did much teaching and writing and left his valuable collections to the University of Columbia. *A Flora of the State of New York* and *A Flora of North America* are among his more notable writings.

Asa Gray was a pupil of Torrey's and later they worked together. In 1842 Gray was made professor of natural history at Harvard where by his labors, ability, writing and teaching he so developed the department that his reputation became not only national but international. Among his writings his botanical textbooks are most widely known. His *Manual of Botany of the Northern United States* was published in 1847 and has "passed through many editions, is clear, accurate and compact to an extraordinary degree and an indispensable book for the student of American botany."

In the hundred years between the beginning of Benjamin Barton's active work and the end of Asa Gray's, there is a steady increase not only in botanical knowledge but in developing the scientific approach.

horticulture

To us with our surfeit of gardening books, it may seem strange that books entirely devoted to horticulture appeared so much later than those on agriculture or botany. *The American Gardener* containing ample directions for the kitchen garden was published in 1804, but the first notable gardening book was *The American Gardener's Calendar* by Bernard M'Mahon, published in 1806. The author, after whom the plant Mahonia was named, had a famous nursery and seed store on Second Street in Philadelphia. At that time it was the largest seed store in the United States and a general gathering place for noted botanists and horticulturists who came to exchange scientific information. M'Mahon made a great effort to introduce plants suitable for cultivation in America. His book was a standard encyclopedia, the last edition appearing in 1857, 51 years after the first.

The first American catalog was brought out in 1823 by William Prince, proprietor of the Linnaean Botanic Garden in New York. It not only lists plants, trees and bulbs but gives cultural directions.

In 1832 came *The Floral Magaine* by D. and C. Landreth. David Landreth was a Scottish nurseryman who settled in Philadelphia in 1786 and established a seed house that is still in business although they have moved to Baltimore. To work with him came another Scotsman, Robert Buist, who himself became

an outstanding nurseryman, paying particular attention to importing roses. *The American Flower Garden Directory,* published in 1832, went into many editions and became an acknowledged guide to practical gardening.

After 1830 practical books on vegetable gardening and fruit culture became more frequent and specialized books on landscape gardening and architecture soon followed. One of the most influential of these was *A Treatise on the Theory and Practice of Landscape Gardening* by A. J. Downing published in 1841.

By 1850, the influence of the more settled condition of the country and its increased prosperity was shown on gardening just as it had been on agriculture and botany. The Pennsylvania Horticultural Society had been organized in 1827, and that of Massachusetts two years later, and both were by 1850 rendering real service. Horticultural books and articles became more and more frequent; they were, however, usually written by professionals for professionals. The garden books of today, largely written for amateurs, began to appear about the turn of this century and within a very short time their number was so impressive that many a reader has wanted to exclaim with Solomon: "Of making many books there is no end and much study is a weariness of the flesh."

Emily Read Cheston is an acknowledged expert on John Bartram. She has written a monograph of Bartram for the John Bartram Association and has been acknowledged for her assistance to several of the country's top botanical scholars. Ms. Cheston worked on the valuable catalog that will accompany the PHS library's bicentennial exhibit, *From Seed to Flower, 1681-1876: A Horticultural Point of View.* The catalog traces Philadelphia's role in American horticultural history. Ms. Cheston has been an active member of the Society for 60 years.

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growing interests

pellaea rotundifolia

photo by M. S. T. Harpo



Dee Peck is membership chairperson, and a charter member of Indoor Light Gardening Society (local and national). She is a member of the Delaware Valley Fern Society as well as several state, national and international fern groups. Dee Peck is a self-taught gardener whose chief interests are tropical ferns under lights and hardy ferns. She is also becoming interested in woodland plants. She is attending classes at the Barnes Arboretum.

For all who are tired of the Boston fern, even in its many variations, a refreshing change is the lovely button fern, *Pellaea rotundifolia.* As its name suggests, its pinnae are round instead of feathery, giving it a somewhat unfernlike appearance. The croziers are reddish green as they unfold and become a rich dark green at maturity. Instead of being stiff and erect, the fronds droop in graceful arcs. This gives it an airy appearance, decoratively comparable to the maidenhair ferns. Its substance, however, is firm and glossy.

Its waxy texture is an excellent defense against fluctuating humidity and an occasional lack of water. In conditions where the maidenhairs would give up and expire, the button fern can survive and be brought back to its original vigor. On at least three occasions, my neglect resulted in limp fronds with dull, apparently lifeless pinnae hanging over the edge of the pot. Immediate watering and misting restored the plant in about two hours, with only a few permanently damaged pinnae. In fact, it survived to win a blue ribbon in the spring Show. Of course, there's a limit. I wouldn't recommend this kind of treatment without a lot of intervening care.

Like all their cousins, button ferns thrive with a humidity of 50% or more, regular watering, a rich, well-drained potting medium, and a regular feeding program. I have used a 1-1-1 mix of sphagnum peat, perlite, and vermiculite with continuous feeding of quarter strength high nitrogen fertilizer, but I prefer a potting medium of two parts rotted log or leaf mold, one part sphagnum peat and one part sharp sand, with feeding only as the fern approaches need for transplanting. This happens quickly with *Pellaea rotundifolia* and it should be somewhat overpotted as rhizome growth is rapid.

It grows well in bright—not sunny— natural light, but prefers the steady, dependability of fluorescent light from which it can be periodically removed to brighten a dark area for a week or so. Not only is it an excellent pot plant, but this beauty from New Zealand also makes a marvelous show in a hanging basket.

Dee Peck

agave parryi

photo by author



Beaty Broughton is a graduate of the Longwood Gardens Professional Gardeners Training Program and is an active member of the Cactus and Succulent Society. She is in charge of the Medicinal Garden at Morris Arboretum.

I first saw an agave perched on the side of a hill overlooking the freeway going into San Francisco. I almost had an accident because I couldn't take my eyes from the magnificent plant.

Finding one to buy was hard, but finally a man in a little begonia greenhouse said, "I think you mean a century plant." He was right. The species that I bought was like the one on the hill: *Agave americana.* The plant reaches 10 ft. in about 12 years, and produces a bloom spike about 15 ft., which is a bit large for use as a house plant.

After collecting agaves from several states in the Southwest, I have found smaller ones that are quite good as house plants. *Agave parryi* produces a beautiful rosette of leathery grey-green leaves with pronounced teeth along the edge and a very strong terminal spine on each leaf. The plant pictured is a matured specimen collected from Prescott, Arizona, in September 1973 at an altitude of 6,000 feet. The plant is still quite small but has grown noticeably in the past two summers outdoors. The winters are cold there and you find more pine forests than in the desert areas. The slow grower matures at about 2 ft. in diameter and becomes 12 to 18 in. tall. The bloom spike is about 5 ft. high with an orange-yellow inflorescence. In nature *Agave parryi* takes at least 12 years to flower. Agaves are native to the Southwestern United States and Central America, with the greatest variety of species centered in Mexico. For that reason, it is usually grown for the foliage rosette rather than the blossom.

The culture is the same as for native plants in the Southwestern U.S. A dormant period is essential. To achieve this, I bring my plants in about mid-September and keep them on a well-lit, unheated sun porch. Because of the low winter temperature, I do not water; however, if the temperature could be maintained at 40°F, I would water several times over the winter. In the house, a cool, well-lit room is best and the plants should be watered

once a month to prevent shriveling. After all danger of frost is past, I put them outdoors for the summer.

Agaves are no exception to the insect problem. However, they are not serious if caught in time. Scale and foliage mealy bugs can be eliminated by dabbing them with a cotton swab dipped in alcohol. But you must be persistent; they will hide down in the leaves. Soil-borne mealy bugs are more difficult to get rid of. Drenching the soil with malathion works.

Propagation is usually done by separating off-shoots from the mother plant. After flowering they produce seeds and bulbils in the inflorescence.

All agaves are slow growing plants requiring a minimum of care. They are shipped bare root from Southwestern nurseries and grow well in a soil mix of ½ coarse sand and ½ topsoil—even the Cornell mix with coarse sand or bird grit is satisfactory.

Named varieties can be obtained from specialty nurseries and are sold in local plant stores.

Beaty Broughton

lygodium japonicum

Plant lovers often delight in plants that are different or unusual. I think this is especially so for those of us who specialize in collections of one plant family. My favorite oddball is *Lygodium japonicum* —a true fern with a vine-like or climbing habit of growth.

Lygodium comes from the Greek word for flexuous (meaning full of bends; winding). The twining fronds of this fern easily climb to 4 or 5 ft. or longer, climbing up or over other plants, poles, trellises, and probably your lace curtains.

Lygodium japonicum has the charm and beauty of the maidenhair fern with its delicate feathery pinnae. It is dimorphic, having both sterile and fertile pinnae on the same frond. Since the pinnae look quite different a mature specimen appears at first glance to be two plants with one growing on top of the other. The sterile pinnae appear at the base of the rachis, while the fertile pinnae are at the terminal end of the rachis.

This is a fern that readily adapts itself to home culture. It requires a moist, well-drained acid soil. Like most ferns it likes high humidity and must never be allowed to dry. A low light level plant that tolerates full sun in winter, it must be shaded the rest of the year. My *L. japonicum* does well climbing up a bamboo pole with only the spillover light from my fluorescent light garden.

Tom Seiler

photo by Tom Seiler



Tom Seiler is a member of the Delaware Valley and New York fern societies. He is past-president of the Philadelphia Chapter of the Indoor Light Gardening Society of America and president of the African Violet Society of Philadelphia. He holds a judges certificate of the African Violet Society of America, Inc., and the American Gloxinia & Gesneriad Society, Inc.

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Jean Byrne, Editor



Using cactus
in dish gardens
See page 22.



THE green scene

HORTICULTURE IN THE DELAWARE VALLEY

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THE
green scene

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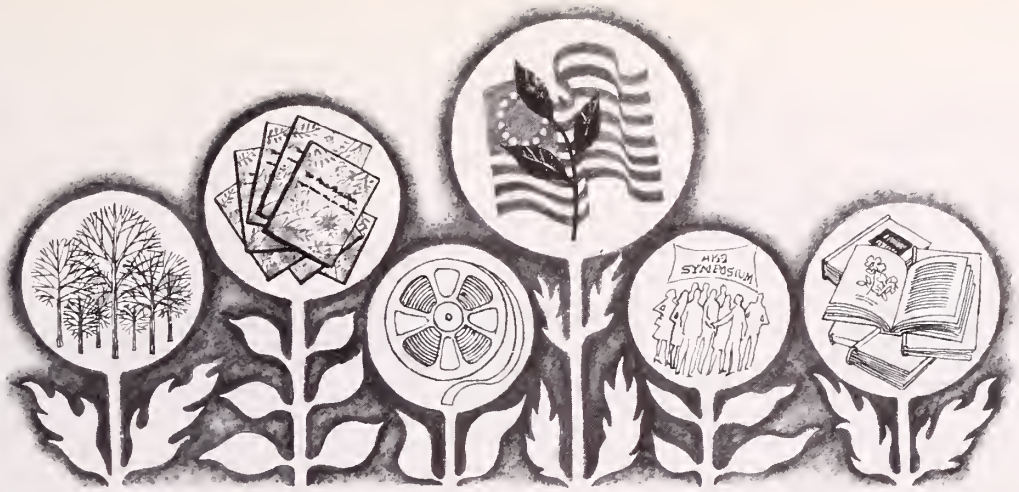
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photo by Edmund B. Gilchrist, Jr.

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photo by Darrel Apps



EVERYTHING'S COMING UP GREEN FOR THE BICENTENNIAL

Comedians won't have Philadelphia to kick around anymore. Our city can now take its place among the best in the country, yes, even around the world. And no small thanks to the bicentennial.

Your Society has been among the most active groups in the city preparing for the bicentennial. Our projects not only offer a way to celebrate the past and present, but several of them will provide a legacy for future generations. Here are some of your Society's projects:

- By next fall, PHS will have planted 10,000 trees in 33 city parks. (It's still not too late to share in the project.)
- We've produced a film about trees, made by one of the country's finest young film-makers. *How Long Is Always* will be seen by thousands of school children and adults all over the country.
- We will play host to 10 horticultural organizations, which have opted to hold their national meetings in Philadelphia throughout the year.
- Starting in April we will hold at our headquarters a superb six-month exhibit of rare books from the 18th and 19th century relating to Philadelphia's role in colonial horticulture. This exhibit may be the last of its kind since books from that era are deteriorating on library shelves (see story on page 30). Your commemorative souvenir of the year can be the fine, two-years-in-the-making catalog that accompanies the exhibit.
- We published the *Philadelphia Area Green Pages: A Handbook of Tools, Information and Resources for the Greening of Philadelphia.* This popular garden resource book has been sold to enthusiastic gardeners all over the city through garden centers and bookstores. It has also been distributed without cost to community groups and schools throughout the city.
- A national horticultural symposium for the bicentennial is being sponsored by the Society—America's Garden Legacy: A Taste for Pleasure. The seven sessions will be spread throughout the year and are being offered in cooperation with 11 horticultural organizations. Each session will start with a guided tour of the cooperating organizations' gardens, followed by a reception, dinner and a lecture presented by an outstanding horticulturist, botanist or historian. The series will give a broad history of amenity horticulture in the United States, with particular emphasis on the Philadelphia area.

We hope when you make your plans to visit PHS during 1976 you will allow time to include the many other wonderful places in Independence National Park. The New Visitor's Center at 3rd & Chestnut Street is elegant in its simplicity, has a wealth of information for tourists and shows daily* the beautiful film about our country's Declaration of Independence. The film was made with uncharacteristic reverence by Hollywood's iconoclastic John Houston.

We look forward to seeing you all at Independence National Park over the next spring, summer and fall.

*The film is shown every 45 minutes Monday through Friday beginning at 9:30; last show begins at 4:15. On weekends it is shown every 30 minutes; last show is at 4:00.

Botanical Will-O-The-Wisp: FRANKLINIA



A round silky bud foretells the cup-shaped lower petal, which distinguishes Franklinia from Gordonia and Stewartia. Bees seeking nectar pollinate this fall-blooming tree.

A 66-year-old Pennsylvania Quaker farmer-botanist and his son discovered it in Georgia in 1765. Eight years later the son again saw it growing in the same place. Following his directions, so did a cousin 17 years after that. Still another 13 years, and a Scottish nurseryman following their trail located it in that area. 1765, 1773, 1777, 1790, and 1803. These are the only records. Since then we have no confirmed sightings of it growing wild anywhere.

The object of the search? An attractive member of the tea family, named *Franklinia alatamaha* by its discoverer, Philadelphian John Bartram: "Franklinia" to honor his "dear beloved friend" Benjamin, and "alatamaha" to commemorate the river near which the discovery was made. The others who also saw it growing wild? They were William Bartram, Dr. Moses Marshall, and John Lyon. There is also a shadowy fifth person: William Malcolm, an English nurseryman who sent Franklinia to Kew Gardens in 1774, probably at the instigation of Bartram's English patron, Dr. John Fothergill. The Kew plant may have originally come from Bartram.

Franklinia's elusiveness is enough to endear it to gardeners with a sense of romance. It has, however, other characteristics that make it desirable. A unique one is its period of bloom in Philadelphia, from late July or early

NOTE: All irregular spellings within quotation marks are as they appeared in the original.

by Barbara Hesse Emerson

Barbara Emerson is technical editor and information specialist for Amchem Products Inc. She is chairperson of the PHS Library Committee. This article is the result of trying to answer a few of the intriguing questions that arose during preparation for the Society's bicentennial exposition of early horticultural books.



Delicate striping in Franklinia bark is distinctive and provides interest all year long.

August until a killing frost. In different latitudes the time seems to vary, as is often the case with other plants. It has been seen flowering as early as April in Georgia, and in July in the Carolinas.

The silky bud and fragrant five-petaled white blossoms with their fluffy crown of golden stamens resemble those of closely related Stewartia and Gordonia, except that one of Franklinia's petals remains cup-shaped. Another distinction is that the globose woody Franklinia seed capsule splits alternately from top to bottom and from bottom to top, whereas the pointed capsules of the other two genera open from the top only. The flowers of *Gordonia lasianthus,* the American loblolly bay, are long-stalked, but those of Franklinia "are produced from the boosoms of the leaves." Franklinia was classified as a Gordonia by some botanists, being invalidly named *Gordonia pubescens.* Even William Bartram once thought it might be a *Gordonia,* but these and other differences clearly identified Franklinia as a separate genus.

William Bartram said of Franklinia, "it grows erect, about 30 feet high, its branches also assend upward." Unlike Georgia's evergreen Gordonia, Franklinia is deciduous. Its leaves turn a glowing red in mid-autumn. Because they tend to be at the ends of the branches, the interior is rather open, revealing gracefully curved branches. The smooth young bark has subtle vertical striping that adds interest throughout the year, especially since Franklinia often grows with multiple stems.

The only native colony of Franklinia ever reported was evidently growing in sand hill bogs bordering swamps on the northeast side of the Altamaha (as it is now spelled) River downstream from old Fort Barrington in McIntosh County near Cox. On his second trip, William Bartram found it in full bloom and recorded that "at this place there are two or three acres of ground where it grows plentifully." Later he wrote,

continued



Gordonia lasianthus



Fruit of the Mountain Stewartia

Barbara Emerson has prepared a fine list of additional readings about the Franklinia. Copies of the list are available through the library of the Pennsylvania Horticultural Society.

FRANKLINIA continued

"I have traveld by land from Pensylvania to the banks of the Missisipi, over almost all the Teritory in that distance between the Seashore & the first mountains, cross'd all the Rivers, and assended them from their capes a many miles, & search'd their various branches Yet never saw This beautiful Tree growing wild but in one spot on the Alatamaha about 30 miles from the Sea Coast neither has any other person that I Know of ever seen or heard of it. And what is very singular, it is so hardy as to stand in an open exposd situation, in the Garden in Pensylvania without suffering the least injury from our most severe frosts, when very few Plants from that country will do in our Green houses." Cultivated Franklinia appears to be hardy as far north as eastern coastal Massachusetts and New York, although there it may be injured in severe winters, and usually develops as a shrub.

We have diary or letter notations about each of the four sightings, but there is little cultural detail. These men were riding horseback through wilderness, carrying with them everything they needed. John Bartram probably found Franklinia only because he had missed his way to Fort Barrington. He was hurrying to a council meeting with Indians and the governor in Florida. It was October, there were no flowers, and the marvel is that among all the unfamiliar southern plants he could recognize one with undistinctive leaves as being new and important.

william bartram saves franklinia from extinction

William Bartram had more time, was better educated than his father, and kept careful notes for his eager British patron. Even so, we do not know precisely where or how Franklinia grew, whether Bartram sent seeds or plants of it elsewhere while traveling, or how he transported from Georgia to Philadelphia the material that has kept Franklinia from becoming extinct. His cousin Humphry Marshall wrote that Bartram brought home ripe seeds "and raised several plants therefrom, which in four years time flowered, and in one year after perfected ripe seed." Whatever Bartram brought back had to be in saddlebags that must have been bursting when he finally reached home.

Marshall's nephew Moses merely mentioned in a letter to Sir Joseph Banks, director of Kew Gardens, that he saw Franklinia in Georgia during a botanic tour. John Lyon was collecting American plants to take back to England. His diary records, "In the bottom between two sand hills very near the site of the old Fort . . . grows Bartrams Franklinia . . . here there is not more than 6 or 8 full grown trees of it which does not spread over more than half an acre of ground."

Plants of it are now produced easily from fresh seed (which ripens as the new flowers appear) rather than by layering as was once considered necessary. It can also be propagated by softwood or hardwood cuttings.

Restricted though it was in native habitat, Franklinia soon became widely known. In John Bartram's broadside *Catalog of American trees, shrubs and herbacious plants,* issued about 1783, Franklinia appears as "Alatamaha," one of three "Undescript Shrubs lately from Florida." It was listed among 162 North American trees and shrubs the Bartrams sent to Europe in 1784 for "Mr. Pierepoint." Humphry Marshall, the Chester County plantsman who wrote the first American book on American trees and who was a cousin of the Bartrams, also collected seeds and plants for Dr. Fothergill. In 1787 the London firm of Grimwood, Hudson, and Barrit asked Marshall for

the price of certain bedded out plants including 100 or more Franklinias, and in 1789 ordered "10 Franklinia" and "20 Gordonia pubescens," the latter a synonym for Franklinia. Marshall's book *Arbustum Americanum,* or the American Grove, published the name and full description of Franklinia for the first time in 1785. Moses Marshall carried on the foreign business of seeds and plants after his uncle's vision became impaired about 1790.

The French botanist Francois André Michaux noted Franklinia blooming in Charleston, early in the nineteenth century, or even in the 1790's when he may have seen it in his father's botanical garden there. A French family friend requested Franklinia seeds from Irénée du Pont about 1802, after du Pont had purchased Franklinias from Bartram. In 1810 the Bartram Botanic Garden listed "Gordonia Pubescens, Franklinia with flowers of delightful fragrance, .50-$1.00." In 1812 John Bartram, Jr., notified New York nurseryman William Prince that he was sending 12 Franklinias on the ship Eliza.

"The original tree brought by Bartram nearly 60 years ago is now nearly 40 feet high. All those in other gardens come from this tree," wrote exuberant botanist Samuel Constantine Rafinesque in 1832. Ten years later Thomas Meehan, who had superintended Bartram's Garden, described the Franklinia there as 30 feet high, but mentioned that "the finest specimen lately blew off in a gale," indicating that there was more than one in the garden.

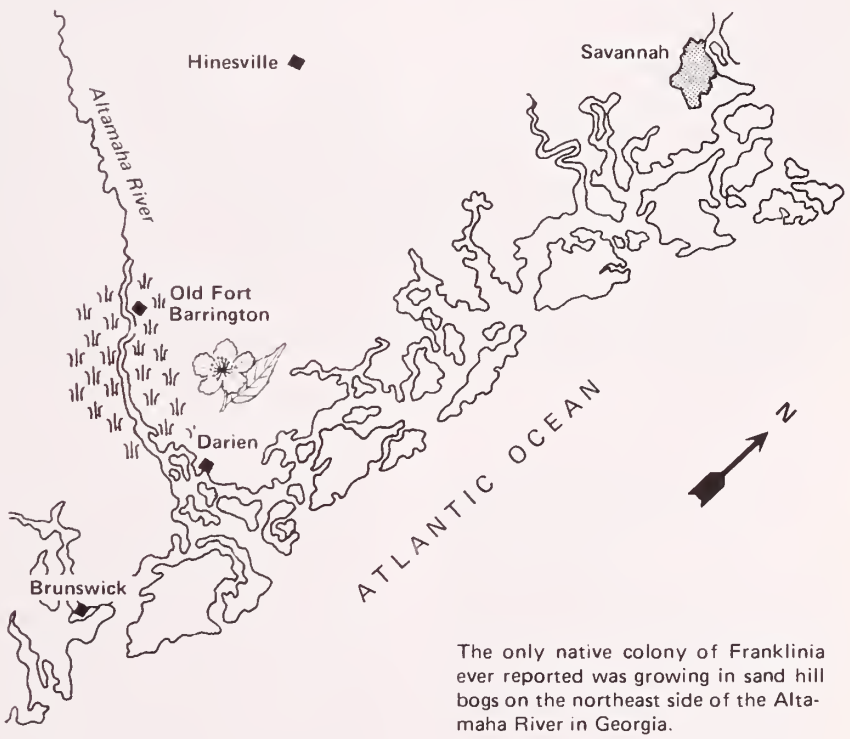
John James Audubon drew a blossoming spray of Franklinia as the perch for a Bachman's warbler in his *Birds of America,* published in 1833, and referred to it as "one of the most beautiful of our southern flowers." The spray was figured for him by Bachman's sister-in-law Maria Martin, who lived in Charleston.

Thomas Meehan propagated Franklinias in his Germantown nursery. Plants of it are now produced easily from fresh seed (which ripens as the

continued



Probably the largest Franklinia in existence, this tree grows in Chestnut Hill with flourishing hollies and rhododendrons. It is 35 ft. tall and 40 ft. wide. In full bloom with green and later with red leaves, it is a magnificent sight.



The only native colony of Franklinia ever reported was growing in sand hill bogs on the northeast side of the Altamaha River in Georgia.



Franklinia leaves cluster at the ends of branches. Fertilization of the flowers that form there becomes evident in the globular seed capsules, which are conspicuous the following autumn.

new flowers appear) rather than by layering as was once considered necessary. It can also be propagated by softwood or hardwood cuttings. Although still not common in cultivation, neither is it rare. Unfortunately, it sometimes falls victim to borers or cankers. Like rhododendrons and many related species, Franklinia requires acid soil, light but with adequate moisture and plenty of humus. It grows best in light shade.

edgar t. wherry searches for the wild franklinia

Many skilled and determined men have hunted in vain for Franklinia in the wild. Searches were made in March, June, July, September, and November, 1881, by South Carolina botanist H. W. Ravenel and a friend. Ravenel mentioned similar searches on both sides of the river by a Mr. Cowper of Darien, and by "a collector of seeds from some Northern house." Dr. Edgar T. Wherry, University of Pennsylvania botanist, reported that "it has been repeatedly sought by collectors of the Arnold Arboretum, the Biltmore [North Carolina] Herbarium, the U.S. Department of Agriculture, and various nursery companies, without success." Dr. Wherry, too, has sought the will-o-the-wisp. During the 1920's he visited the Fort Barrington region in three successive years—in spring, in summer, and in autumn—without finding Franklinia. On one of these trips he met an elderly Indian who was an herb collector and familiar with the region. Examining Dr. Wherry's pressed specimen from a cultivated Franklinia, the Indian said he had not ever seen that, dashing a faint hope that there might be another colony somewhere. In the 1930's an enthusiastic amateur horticulturist, Dr. C. C. Harrold of Macon, Georgia, distributed colored illustrations of Franklinia flowers and leaves among Boy Scouts, farmers, hunters, and woodsmen and offered a reward for the discovery of a living wild plant, but it hasn't been claimed.

Dr. Wherry was sent to Georgia on a fourth trip after newspapers circulated a report that Franklinia had been rediscovered by a forester, but the claim proved to have no basis in fact. Later, a botanical artist stated that as a child in the Georgia mountains she was quite familiar with Franklinia growing abundantly in one ravine, but its presence has never been confirmed. Probably what she remembered was really Stewartia. Even Francis Harper, the John Bartram Association research associate who has spent more time and thought reconstructing William Bartram's travels than anyone else, was once momentarily deluded into thinking some unusually large young leaves of *Myrica caroliniensis* (bayberry) were the long-sought Franklinia. Harper, too, has scoured the area, in company with Arthur N. Leeds, Philadelphia Academy of Natural Sciences botanist, and later alone.

Writing in 1937, Harper considered several possible explanations for Franklinia's disappearance from the wild, but came to no firm conclusion. Instead, he held out a slim hope that wild plants of it might yet exist. Misunderstanding about the actual road traveled by the Bartrams near Fort Barrington may partly explain the failure to find Franklinia. Harper suggested another, possibly more important, aspect. If, instead of being a river-swamp species, Franklinia inhabited sand hill bogs, or boggy places at the heads of sand hill branches, the region in which Franklinia might be found is much larger than has been considered. The sand hills apparently extend as far as Beard's Creek and throughout what is known as the Altamaha Grit Region, covering about 10,000 square miles in the Coastal Plain of Georgia. This is an area Bartram is not known to have explored, a vast region still to be searched by would-be Franklinia rediscoverers as the will-o-the-wisp continues to beckon.

●



The First 200 Years of Daylilies in America

by Darrel Apps
photos by author

Darrel Apps is a member of the American Hemerocallis Society and a hybridizer of miniature daylilies. His garden contains 130 different cultivars plus several of the original species from Asian countries. He has been breeding daylilies since 1969 and plans to introduce cultivars shortly. Dr. Apps is head of the Department of Education at Longwood Gardens.



With few exceptions most recently introduced daylilies are the wide-petaled types. Some feel that this characteristic was selected from the species *H. middendorffi.*

The year is 1946. It is the first gathering of members of what is to become the future national daylily society. Imagine, if you will, two roommates about to fall asleep after a long day of excitement and discussion at the meeting. One says to the other, "Do you think we will ever have colors that are truly clear pink, red and purple?" After a long pause – a reply. "Oh, I think so, remember when there was only yellow and orange."

gardeners need to try new daylilies

Thirty years later that goal and many others have been reached but one major problem exists—the general gardening public has still not become familiar with the new types. To many people the tawny daylily, *Hemerocallis fulva* 'Europa' and the lemon daylily, *Hemerocallis lilioasphodelus (H. flava)* are the only ones they know.

continued

Daylilies continued

Certainly both the new cultivars and the older species types have a place, but it would seem that it is now about time that gardeners learn of the great improvements in this genera. It is an understatement to say, "What the breeders have worked with and what the amateur gardeners have seen are miles apart."

. . . it is breeder snobbery.

Some argue the reason for this dilemma is a lack of education. A few members of our American Hemerocallis Society have told me it is breeder snobbery. Others have said it is public apathy in general. I think it can be attributed to two things: (1) we simply have not had enough time to expose the public to the best of the new cultivars, say nothing about the events in history that were so important in helping to bring about these new cultivars, and (2) we have not been able to produce (rapidly propagate) any one cultivar in quantity in a short period of time.

Knowing the "daylily nuts" as I do, we will overcome these hurdles. In fact, I doubt whether any of us will be satisfied until we have a cultivar that compares with the peace rose for notoriety —Step aside Rosarians we need a place next to you at the top.

rapid propagation will make daylilies more commonplace

By now some of you are wondering just why I think daylilies are going to make rapid advances. Simplified, there are two reasons: (1) the new colors, length of blossoming time, and better plant habits will fit the needs of nearly every gardener; and (2) just this past year Dr. Charles Heuser and myself have discovered through research at The Pennsylvania State University that we can propagate cultivars quickly by using cells of immature flower parts. (This research is to be published sometime this year in the *Canadian Journal of Botany.*)

We expect innovative nurseries to adopt these rapid propagation techniques (after they are perfected) and to produce daylilies in two-gallon containers much like blue rug junipers. Once a cultivar is selected it is possible to produce several thousand in three to five years rather than 30 to 50 in the same time period with the older division technique.

The real challenge ahead lies with the breeder. He must select only plants with exceptional merit, worthy of propagation in large numbers. I think that breeders will be able to accept this challenge and make certain cultivars commonplace—or at least as common as the tawny daylily. Please realize that I make this prediction based somewhat on what has happened with this genera historically. In the ensuing paragraphs I will try to outline what I consider are some of the major events in our past.

america's first two daylilies

So far I have mentioned two daylily species, *H. fulva* 'Europa' and *H. lilioasphodelus.* The first is really a clone of the species. It is over 400 years old. It can be traced back to the writing of Lobel in *Historia,* 1576. Remarkable, when one considers that is has been propagated by division, not seeds. In cytological work by Arlow Stout at the New York Botanical Garden, in the 1920's, the tawny daylily was found to have 33 chromosomes (triploid) rather than the normal 22. Because it is a non-breeding triploid and therefore a clone, Stout named it 'Europa' (based on the fact that it is widely cultivated in Europe).

In the Delaware Valley it is prominent along the roadside and blooms about June 20. Its relative, the lemon daylily, blooms about May 20 and is less common. These two daylilies were the first to reach this country. The exact entry dates are unknown. Most likely John Bartram received them in a plant shipment during the latter part of the 18th century from an English cloth merchant and avid gardener, Peter Collinson. There is not positive proof of this. However, Thomas Nuttall's *The Genera of North American Plants and a Catalogue of the Species of the Year 1812* mentions that *H. fulva* had naturalized in moist meadows in secluded areas on the banks of the Schuylkill, which would be near the residence Bartram built in 1731. Further evidence that at least these two species reached America early is found in Bernard M'Mahon's *The American Gardener's Calendar* (1805). He lists both orange and yellow daylilies.

"Coming together is the beginning. Keeping together is progress. Working together is success."

How sad my summer garden, and the entire American Hemerocallis Society, would be if only these two plants were in cultivation. Not because we dislike them, but because they have little breeding potential. *H. fulva* 'Europa' is pod sterile and cannot receive the pollen of the earlier blooming *H. lilioasphodelus.* The reciprocal cross is possible but unlikely because it requires storing pollen. Further, both of these plants have rhizomatous roots, a highly undesirable garden quality.

the history of our modern daylilies

Therefore, the story of modern wide-petaled, bright colored daylilies does not include the first types to arrive in America. The history of our modern cultivars begins before the 1700's with introduction of species from their native Asian countries to Europe. We can speculate that the medieval Mongol settlers brought yellow daylilies via their overland trade routes to Hungary; Chinese-Arabian-Phoenician traders might have introduced the tawny daylily to Venice, and the Portuguese traders might have brought the tawny daylily to Lisbon. Along with these types there might have been other species.

Records are sparse but perhaps the most important daylilies did reach Europe by the late 1890's. About this time George Yeld, an English school teacher, began his breeding work. Yeld's first inter-species crosses were with *H. lilioasphodelus, H. dumortieri, H. midden-*



Bud count is extremely important if a plant is to be in bloom over a long time period. This seedling of Winning Ways and Golden Chimes has a bud count of 75 on well-branched scapes. In the breeding of Golden Chimes is the species *H. multiflora* noted for branching and many buds.



Modern daylilies often have genes for rebloom. This seedling of Golden Chimes and Perennial Pleasure blooms over a period of nearly 8 weeks. Breeders feel this characteristic was extracted from the reblooming *H. aurantiaca.*



Daylily clumps spaced 3-4 ft. apart give the most pleasing landscape effect and display individual plant characteristics best. If a single cultivar is used, closer spacing presents an interesting mass effect.

dorffi, and *H. minor,* all early bloomers. In about 1900 he made other crosses between late bloomers *H. thunbergi, H. citrina, H. aurantiaca* and *H. aurantiaca* 'Major' and subsequently crosses between early and late forms. From these crosses cultivars were named and introduced to commerce. Apricot, selected in 1892, is usually considered one of the first cultivars named from a planned cross.

Perhaps the most significant American figure in early daylily work was Arlow Stout (1876-1957). Stout was a trained botanist and spent most of his career at the New York Botanical Garden. In 1912 he published his first article on the fertility and sterility in *Hemerocallis* (Torreya 21; 57-62). While at the New York Botanical Garden he collected most species in cultivation from Europe. Later his many hybrids became the foundation breeding stock for future "pollen dabbers." His book of 1934 *Daylilies* gave great impetus to many gardeners. Equally significant to his book and scientific publishing was a friendship he developed with Albert Steward.

Steward was a native of California and a graduate of Oregon State University and Harvard. In 1921 he went to Nanking University, China, as a professor of botany. Steward developed friendships with the Chinese people and was greatly rewarded by being permitted to collect plants from gardens of the rich as well as from farms of the poor. Stout made contact with Steward and an exchange of plants ensued. If Steward had not been in China at the time, our daylily cultivars would probably still be mainly yellow and orange.

Most notable among the plants sent Stout were (1) diploid forms of *H. fulva* which proved successful in breeding for reds, (2) the variety rosea of *H. fulva* which in a breeding program with yellow lines produced a rich red cultivar that Stout named Vulcan, and (3) two new species *H. multiflora* (used to produce multiple branching and late flowering) and *H. altissima* (also a late bloomer with the additional qualities of being nocturnal, fragrant and with tall scapes).

With the framework for the develop-

continued

Daylilies continued



Daylilies are most effective when clumps are at least 3-years-old. Although more attractive than many named cultivars this seedling of Golden Chimes and Perennial Pleasure did not meet the author's standards for introductions.

ment of horticultural clones well established all that was needed was breeders and an organization for continued momentum and continuity. Both would fall in line rapidly.

Most renowned of the early breeders is the late Ezra Kraus who was a professor of botany first at the University of Chicago and later at Oregon State University. Kraus grew thousands of seedlings of many colors, selected out the best combinations and introduced them. Many cultivars in gardens today bear his name.

The formation of the American Hemerocallis Society is a story of enthusiasm. Interest had built in daylilies due to information Stout published in The American Plant Life Society's publication, *Herbertia* (1935-41). *Flower Grower Magazine* and radio station KDKF of Henry Field Seed Company, Shenandoah, Iowa, sponsored "Round Robins" where people could exchange gardening information. By 1946 with the war over gardening was on the move and pressure from gardeners encouraged Henry Field Seed Company to renew its flower shows that were so popular before the war. Marie Anderson, coordinator of the "Round Robin Reserves," initiated the idea that the new flower show should feature daylilies. The radio station announcer, Helen Field Fischer, accepted the idea and the promotion was on.

On July 13, 1946, the public came to the show and the "garden club of the air" entertained. The crowd was much larger than expected and many stayed over. The next day the Midwest Hemerocallis Society was formed. At the end of the charter year 757 new members had paid their $3.00 dues. By 1948 the society had representatives at its convention from 43 states, England and Canada. A name change that year brought about the American Hemerocallis Society.

As you might imagine the formation of our society is only a beginning for the genera, *Hemerocallis*. In the years that have followed many breeders have spent untold hours perfecting cultivars. July 14, 1976, is our thirtieth birthday. We are a mature society but I believe the main part of our life is still ahead. Our accomplishments are many and there is still much that needs to be done. For instance, colchicine-induced tetraploids and tetraploid breeding are scarcely a decade old. Rapid propagation is just about to begin. Perhaps protoplast fusion is next!

In 1947 Gretchen Harshbarger wrote in the first edition of the Midwest Hemerocallis Society yearbook, "Coming together is the beginning. Keeping together is progress. Working together is success." As we reflect during this bicentennial year, we have had our beginning, our progress and our successes. We will not rest on our laurels.

At some future national daylily meeting two tired members will go to bed one night. One will say, "It's too bad we couldn't have had those clear blue and pure white cultivars in '76 to fill in the other two colors of our bicentennial flag." Perhaps there will be a pause and then this reply, "What is worth having is worth waiting for."

The cultivars listed are worth having.

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Cultivar	Breeder	Height	Season of Blooming	Diameter of Flower	Fragrance	Nocturnal	Foliage Habit
Near White							
Iron Gate Glacier	Van Seller	28"	Midseason	5½"	x		Dormant
White Vision	Lenington	24"	Midseason to late	5½"			Semi-evergreen
Yellow							
Hope Diamond	Macmillan	14"	Early to midseason (rebloom)	4"			Dormant
Perennial Pleasure	Hardy	26"	Midseason (rebloom)	5½"			Dormant
Wining Ways	Wild	32"	Early to midseason	6"			Dormant
Deep Yellow							
Full Reward	McVicker-Murphy	34"	Early to midseason	5½"			Dormant
Hortensia	Branch	34"	Midseason (rebloom)	5"	x	x	Dormant
*Mary Todd	Fay	26"	Midseason (rebloom)	6"			Semi-evergreen
Todd Grovatt	Grovatt	29"	Midseason	5"	x	x	Dormant
Orange							
Golden Gift	Wild	32"	Midseason	4"			Dormant
*Golden Prize	Peck	26"	Late	7"			Dormant
*Rocket City	Hardy	36"	Early to midseason	6"			Dormant
Pink							
Edna Spalding	Spalding	24"	Midseason	4½"			Semi-evergreen
Jubilee Pink	Spalding	28"	Midseason to late	5½"	x		Semi-evergreen
Precious One	Winniford	30"	Early	5½"			Dormant
Winsome Lady	Gates	24"	Early (rebloom)	5½"	x		Dormant
Lavender							
Catherine Woodberry	Childs	30"	Midseason to late	6"	x (very)		Dormant
Prairie Blue Eyes	Marsh	28"	Midseason	5¼"			Semi-evergreen
Bright Red							
Red Siren	Claar-Parry	34"	Midseason	5½"			Dormant
Rocket Beach	Tanner	28"	Midseason to late	6"			Semi-evergreen
Sail On	Claar-Parry	34"	Midseason	5½"			Dormant
Dark Red							
Buddha	Whatley	30"	Early to midseason (rebloom)	5"			Dormant
Ed Murray	Grovatt	30"	Midseason	4"			Dormant
*Tovarich	Munson	28"	Early to midseason	6"			Evergreen
Violet-Purple							
Cajun Caprice	Wiese	20"	Very early (rebloom)	6½"	x	x	Evergreen
Marsh Pixie	Yancy-Harrison	36"	Early (rebloom)	4¾"	x	x	Evergreen
Miniatures							
Yellow							
Bitsy	Warner	18"	Early (rebloom)	1½"		x	Evergreen
Raindrops	Kennedy	12"	Midseason	2"	x		Semi-evergreen
Green Flutter	Williamson	20"	Late (rebloom)	3"			Semi-evergreen
Melon Blends							
Bible Story	Reckamp	30"	Midseason (rebloom)	3"	x		Dormant
Little Rainbow	Reckamp	24"	Early to midseason	2"			Dormant
Orange							
Bertie Ferris	Winniford	20"	Early	2½"			Dormant
Thumbelina	Fischer	15"	Midseason	2"			Dormant
Orange Red							
Red Mittens	Heinemann	24"	Midseason to late	2½"			Dormant
Raspberry Red							
Little Business	Maxwell	15"	Early to midseason (rebloom)	3"			Semi-evergreen
Purple							
Little Grapette	Williamson	12"	Early	2"			Semi-evergreen
Little Wart	Spalding	24"	Midseason	3½"			Dormant

*Tetraploid

NOTE: Addresses of breeders who sell plants can be obtained by writing directly to:

Mrs. Arthur Parry, Secretary
American Hemerocallis Society
Signal Mountain, Tennessee 37377

a different kind of survival kit



photo credits courtesy of W. Atlee Burpee

Chives

Democracy has nothing to fear as long as the people love work and enjoy the land and growing things. Only through the cultivation of home gardening and horticulture as a recreation can we prevent the loss of our agricultural and natural heritage altogether.

—Benjamin Franklin

Not everyone has a deep yearning to become involved in time-consuming, culinary gardening. The common bond, however, that is shared universally, lies in the palate, pocketbook, and more important, survival for future generations. There are no substitutes for eating; without food we perish.

Based on an analysis from the United States Department of Agriculture, United States' production capacity appears to be fully ample to meet domestic and export demands at least through 1985. But then what?

Anticipated shortages are long-range problems, and the only way to combat them is with long-range planning. Where better to start than in one's own yard. Any sensible long-range plan must necessarily include the basic backbone and foundation of all gardens and landscaping—perennial plantings. Once established, these fruits provide unending returns for decades without total commitment to Mother Earth. If you've already become a gardening devotee, a

by Jan Riemer

The idea for this article grew out of discarded plans for Jan Riemer's second book. The publisher wanted a much larger book than Ms. Riemer wished to take on. Her first book was *The Beginner's Kitchen Garden* published by Morrow in 1975.

basically perennial plan will yield an almost maintenance-free yearly return allowing time to supplement plantings of spring and summer selections of quick and easy to grow seasonal crops. Perennial plantings also release precious time that can be used for other activities. By raising and storing your own vegetables, herbs and fruits a savings of over 60% can be realized by eliminating profits from canners, packers, processors, advertisers, truckers and retailers.

Climatically, there's a choice of raising something perennial for almost everyone simply by using all parts of the yard—spacious or cramped, sun-drenched or partially shaded—that can be adapted for the cultivation of perennial eatables: fruits, herbs and vegetables. For example, early, mid and late season fruit-bearing-hedges can be used as property dividers, replacing the ornamental, non-producing varieties. Blueberries are a classic example combining fruit and beauty. In the spring. clusters of pink-tinged white bells promise summer berries of the deepest blue snuggled amidst green leaves that turn to autumn's red. Fifteen uniform bushes, planted 3 ft. apart in a sunny, moist and well-drained, acid soil will yield about 50 quarts of berries each year.

Vitamin conscious gardeners are planting hedges that grow 5 to 6 ft. tall, providing magnificent spring to fall displays of crimson roses that produce hips the first season. Although these bushes are commonly grown in Europe, we in the United States know little about them. All rose bushes have hips, but all are not as pleasantly palatable, nor as strong and thick as *Rosa rugosa.* Five of these bushes will provide a 10 ft. long hedge and enough vitamin C to supply a family of four during an entire winter.

Perennial vegetables, unfortunately, are in the minority and include only asparagus, Jerusalem artichokes, rhubarb and some of the onion family. These, however, can have a long life span. It's reported that in Chester County, Pa., one bed of asparagus has been in existence for 65 years.

Fruit and nut trees, dwarf and standards, are taking precedence over the non-fruiters by gracefully landscaping awkward yard areas. At the same time they produce fruits developed from magnificent shades of pink and white spring blossoms, while ultimately the heavily ladened branches provide canopies of shade to keep our homes cool and fresh, reducing use of energy consuming air conditioners.

Perennial herb plantings for teas, such as lemon balm and the mint family, or culinary herbs that might include rosemary and tarragon, and finally a few medicinal herbs, aconite, horseheal or lamb's ear, all require only a small area and have a myriad of uses. They can be dried, stored or frozen, while chives, oregano, marjoram and thyme, if cut back severely, potted and rotated in a sunny window, can be used indoors during the winter months.

Starting a perennial garden, and perhaps a miniature orchard will, of course, initially require time, effort and know-how. To achieve the most productive yields over the longest period of time, proper soil preparation and planting is paramount. For the home gardener, because commercial fertilizers have joined the ranks of existing shortages, such preparation can mean going "natural." Organic gardening is a no-waste system designed to operate in harmony with nature by supplying every available product that provides nutrients to the soil in an organic form such an animal manure, or green manure crops. Avoid the inorganic nitrogen, phosphorous or potassium fertilizers or chemical weed or insect killers that can cause adverse environmental effects. You simply make a compost heap using all uncooked kitchen wastes, with care not to include fats or materials that will attract rodents, flies or animals; add layers of leaves, soil, bone meal, lime and wood ashes and repeat until the pile is about 4 ft. tall. Turn a few times, water, and it will begin to decompose. The residue is dug into the soil about 4 in. deep and will supply a balanced fertilizer.

Our plan of survival can be accomplished with fun and satisfaction if it's approached gradually, comfortably and at your own pace, remembering that once established, there's a minimum amount of give and a maximum amount of take.

Now that the perennial seed of awareness has been planted, your oasis will begin to unfold as you await a fruitful life.

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Prunus sieboldi 'Naden' (flowering cherry)



Oregano

MOVING

Moving a garden is no small chore – particularly when it involves boulders, benches and statuary, to say nothing of 468 trees and shrubs, ranging from a few inches high up to 12 ft.

by Mary B. Hopkins

Mary Hopkins is a landscape designer and consultant. She teaches at the Barnes Foundation School of Horticulture. In June, she will lead a study tour to great houses and gardens of England and Wales. Her recent designs include the Mable Pew Myrin Memorial Garden at Lankenau Hospital. Her specialty is year-round beauty and low maintenance.



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photos by John Hopkins



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1. Blending the old with the new. A pleasant grouping is created by the front door by framing a cherub with *Aucuba japonica variegata*. The unit is displayed to good advantage against the already existing hedge, *Ilex crenata*.
2. General background of already existing conifers. Twelve-foot borders of azaleas were extending out from this. Note the large boxwood, looking quite settled in their new location, framing an antique stone bench, originally from Mary Hopkins's parents' home.
3. Close-up – bench and box.

My husband and I have always managed our garden completely on our own, but this clearly was a job for a professional contractor. It took six men four days to move our material in three trucks. The furniture that followed was incidental.

There are many "do's" and "don't's" about moving plant material and we followed all the rules. We had propagated most of the plants and it was an excellent time to "break up housekeeping," for our borders were beginning to bulge. And so, as a result of our mass transit, we left behind a garden far superior to its recently crowded state.

We had purchased our new home in November and would take possession of it in March. If there must be one massive move, March is ideal because it fulfills most of the "do's."

The prime consideration in moving material should be to enable the plant to put forth new growth as soon as favorable conditions present themselves. The new growth may be immediate or delayed, according to the season. Plants differ in optimum transplanting time. Evergreens should be placed in a warm

A GARDEN





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soil; it induces immediate growth of fibrous roots. Very early spring (March) is the best time. The plant will be well established before hot weather comes. If it is necessary to move conifers in the fall, be sure that the plant has several weeks of warm weather before winter approaches, to allow fibrous roots to take hold. If the plant must be moved in cold weather, mulch it with several inches of barnyard litter, which will keep the soil warm for the period of time needed for initial root growth.

Do not move plants if there has not been sufficient rainfall in the late fall. The plants are dependent on the water stored in them until the roots are established. Without a good internal supply of moisture, the plants cannot offset water loss caused by transpiration. That is particularly true of broad-leaved evergreens, which have greater opportunity for water loss than the conifers. Deciduous trees and shrubs should be moved while dormant to reduce water loss.

To survive, a few trees should be moved at specific times. Birches, dogwoods and the willow oak *(Quercus phellos)* should be moved in February. Magnolias must be moved when in full bloom. If you cannot conform to these seasonal times and the material must be moved in the hot summer, plants should be healed in a shady spot with a light, loamy soil surrounding the balled and burlapped plants. They must be kept thoroughly watered and then moved into position in early fall.

Pruning. Ideally, a plant should be root-pruned a full growing season before a move. The pruning forces fibrous roots to develop in a small area so that the new root system is moved with the tree in its entirety. The best way to do this is to dig a vertical trench within the area to be moved with the tree. Fill the trench with humus, thus creating optimum growing conditions for a fibrous root system. If such preparation is not possible, then a larger ball will have to be taken to include a larger area of fibrous roots. The plant should be burlapped so the ball will not fall apart. If it is a large shrub or tree, prune heavily taking from the top the same amount as taken from the root system. For example, we reduced a 16 ft. high *Corylopsis platypetala* to 6 ft., pruning each branch back to an outside node, encouraging new growth. In three years, this plant should assume the same proportion as an unpruned plant, but it has required a great deal less "post-operative" care and with minimum risk of loss.

Plants should be moved into carefully prepared beds. We needed a bed about 100 ft. long and 12 ft. wide for our azaleas. We removed the grass and spaded the entire area 12 in. deep. Loose, friable soil would quickly encourage root growth. Then we dug individual holes for each plant. Always dig a hole several inches larger than the plant entering it. At the bottom of each hole we turned the soil with a digging fork so that another 12 in. of soil was loosened below the new plant. Then we added several inches of peat and humus, placed the plant in the hole, removed the burlap from its sides and filled the hole with the same peat and humus mixture. Many advise leaving on the burlap. That is done so the ball of the plant will not be broken. It is

continued

4. A new unit at the drive entrance. Note the contrast of texture provided by spiked leaves (*Yucca tomentosa*) and rounded leaves (*Azalea* 'Rosebud'). Further contrast and depth are provided by rocks carefully selected for their shape and color. A tracery of stems, giving height and grace to the entire unit, is provided by *Corylopsis platypetala* in the background. This early blooming pale yellow flower is complemented by the surrounding lower shrubs of the early lavender *Azalea mucronulata*.



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true that eventually it will rot. Root activity, however, will certainly be inhibited for a season, and water will have difficulty penetrating the burlap. If the plant is delivered into the hole and not moved after the burlap is removed, the ball will not break. Do not remove it from the bottom of the plant.

Spacing. Another major consideration is spacing. It you plant for immediate effect, then in a few years, plants will be crowded and contorted. We placed our azaleas 6 ft. apart knowing that in three years the beds would look established. It is essential to place *all* the plant material in the beds *before* planting anything, then space can be adjusted before digging holes. If dealing with large trees or shrubs, the plant's dimension should be accurately measured and stakes placed for the holes. A thorough and realistic judgment of the plant's ultimate size should also determine the space allowed. If extremely small plants are used, then plant double the number needed with the intention of removing half the material to another bed in about three years. Or you can create a pleasant effect by inter-planting annuals for several years.

Stock that is planted too deeply will have its growth stunted, have its bloom affected and will often die within two years. A plant should be placed so that it is actually on a rise above the ground. It is wise to make a well of dirt a few inches out from the trunk to confine the water after a plant is in the ground.

Watering. The future health of the plant now depends more on one factor than any other—watering. I start my watering program as I am planting. When the planting hole is half-way filled with dirt, I water. The purpose is to alleviate any air spaces existing around the roots. After the material is planted, I let the hose run slowly on it, while I am planting the next item. Then, for the next two years, the root systems should never be allowed to dry out. Deep watering is necessary several times a week during summer months. Water the tops as well as the roots. A mulch of salt hay or wood chips will keep the water from evaporating so readily. This same mulch will keep the plants from heaving out of the ground in the winter and keep the roots at a steady temperature. Alternate thawing and freezing will split the roots, which is most detrimental.

Use extreme caution when fertilizing newly planted material. Leaves and roots are not in condition to use a normal application of fertilizer. Such practice will retard rather than promote growth. Well-rotted manure can be worked into the soil at the time of planting; don't let it come in contact with the roots. It should be available as the roots develop out into the surrounding area. Early in the spring after planting, apply the usual fertilizer in a solution of water, but reduce the quantity to a quarter per cent of the recommended amount. Do this every four weeks until August 1st. Plants should not be fertilized after midsummer because the new growth will not have an opportunity to harden before frost. If I am fertilizing smaller shrubs, I pour the solution over the entire plant, to stimulate the top as well as the root system. Once a plant has resumed its normal vigor, which will probably be several years, you can follow a normal

5. A garden of dwarf plant material is installed, with weeping and upright material contrasted with rocks and statuary. The hedge was planted by John Hopkins just six months before this picture and is already full and lush. It is *Elaeagnus pungens,* is evergreen, grows in sun or shade and has a most fragrant blossom in November.
6. Water runs slowly into the soil of the newly planted tree as Dr. Hopkins makes a trench on the downhill side. The wheelbarrow contains the dirt removed from the hole, which is now filled with a combination of peat and humus. The discarded burlap is in the right-hand corner.





6

fertilizing program.

Trees, large and small, should have guy wires to counteract the effects of wind. Three wires will hold the plant in place until the root system stabilizes the tree's balance.

A few plants will resist being moved. I respected this great homing instinct, left the mother plant and took cuttings. Pyracantha is one such plant, and we had a particularly fine specimen of *Pyracantha crenulata flava.* Even a rooted cutting of this plant moves poorly. So I took a cutting, dug a hole in the spot where I wanted it to remain, filled the hole with sharp sand and peat in equal proportions, inserted the cutting and put a jar on top. Now, a year and a half later, the cutting is 6 in. high and covered with its delightful yellow fruit. I also left all the cotoneasters behind and simply bought small new specimens.

Large Material. Since we have moved, we have transplanted some very large material that was already on the property. Again we followed our early March schedule. All literature warned us that stewartias were most difficult to move, so we approached our 30 ft. specimen *Stewartia pseudo-camellia* with great apprehension. My husband found that the roots were very shallow. He and three high school boys were able to raise it on a plank out of its hole and roll it on logs to its new location. Since pruning it would have ruined its form and since we were moving it while dormant, we did not reduce its size. We just sprayed it daily all summer to compensate for its root reduction.

A most knowledgable 16-year-old boy balled and burlapped boxwoods 5 ft. in diameter for us. We borrowed a dolly from a nursery and rolled them across the lawn. Again we did not prune, but had we done so, new growth would immediately have been set forth on the bare wood.

Perhaps my husband's greatest triumph was moving an *Elaeagnus pungens* hedge. He and one helper accomplished that in one day. Each plant was pruned heavily the day before the move. I took out three-fourths of the growth. I pruned *through* as well as *down.* I reduced the plant to half its height, then I reduced the remaining portion to half its density. The pruning left a very neat plant, still of considerable size; it not only removed all strain on the root system, it also allowed light and air into the interior of the plant. Now, six months later as I write this in November, the hedge is in full bloom and its delicious aroma scents our entire terrace area. It has already partially regained its height and we have tip pruned it twice to encourage a dense new growth.

In the year and a half that we have been here, the new is already blending with the old and it is often impossible to determine what was here and what was added. We have only lost our *Virburnum carlesi,* which I think should be added to the "not to be moved" list.

As I sit here on the terrace now just two years after the original purchase of the property, I feel quite at home, surrounded by all my treasures. It is particularly satisfying to know that because of our unrelenting efforts, our plants have adjusted well and now have the renewed vigor to survive on their own with minimal care.

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photo by Cortlandt V. D. Hubbard

THE HIGHLANDS:

by Phyllis L. Herring

Phyllis L. Herring is a landscape designer who has become interested in preservation and restoration of historical gardens and landscapes on a national level. Ms. Herring played a large role in researching and documenting the history of The Highland Gardens preparatory to its anticipated restoration. Anyone interested in further information can contact Ms. Herring, *The Green Scene,* 325 Walnut Street, Phila., Pa. 19106.



Above. Front showing potted plants and Balsam fir planted by Sheaff.

Below. Aerial view from North showing back of house and crenelated wall.



photo by Cortlandt V. D. Hubbard

then and now

At left. Boxwood path looking south, taken before 1939.

Below. Boxwood path as it is now.

photo by author



A 20th Century Wuthering Heights or a Potential Showplace?

Searching through local history books for references to old gardens is a favorite garden hobby of ours. Locating the old gardens, however, is often a disappointing pursuit, for in many cases, golf courses and snack bars, colleges and condominiums now occupy the sites where a once great garden flourished. With luck the garden at The Highlands could prove to be an exception.

Few people in the Philadelphia area are aware that a garden of the stature of Virginia's fine Gunston Hall or Westover is just around the corner. Although presently in discouraging condition, it is still intact and restoration is possible, only if undertaken immediately.

suitable for a statesman

The Highlands was built in 1796 by Anthony Morris, on a site overlooking the Whitemarsh Valley. It was a country house suitable to the needs of the statesman who undoubtedly entertained many of our founding fathers. The gardens were added later in the early 1800's when George Sheaff, prosperous wine merchant, acquired the property and began to develop it into what historian Andrew Jackson Downing described as "a striking example of science, skill and taste, of no common interest from an agricultural as well as ornamental point of view and . . . taken as a whole . . . with few in the Union superior to it." *(A Treatise on the Theory and Practise of Landscape Gardening,* 1844.)

Although during the same period in England, The Landscape School led by Capability Brown and Humphrey Repton was ripping and tearing away at the old formal gardens, Sheaff chose to follow those earlier 18th century gardens that were walled and more formal in plan. He reflected the dawning romanticism of the day, however, by whimsically adding a crenelated wall and fanciful Gothic garden houses.

Throughout the 19th century, the property continued to be in the Sheaff family and, only in the years following the death of his son John in 1915, did it fall into great disrepair. The grim conditions of the garden today are almost an exact parallel.

Luckily, the next owner, Caroline Sinkler, came to the rescue, building a garden of remarkable charm from what was reportedly an overgrown field, more woods than garden, with reforestation taking place in former flower borders. For her efforts she was awarded a Pennsylvania Horticultural Society Gold Medal in 1933.

Sinkler and her architect, Wilson Eyre, drew up a plan that was in harmony with both the site and the existing structures and plants. Happily, a young Scottish gardener, Archie Coutts, heard about the project on the boat as he sailed for America. He came to work for Sinkler and stayed for the rest of his life. To him is due much of the credit for the elegance of the garden and the bountiful greenhouse of those days.[1]

When Caroline Sinkler died, The Highlands was sold to her niece and husband, Mr. and Mrs. Nicholas G. Roosevelt. The Roosevelts continued to maintain the garden according to their former elegance, opening house and garden frequently to garden clubs and other visitors.

continued

[1] Old photographs show a lavish use of potted tropical plants as summer decoration on the terrace and within the garden itself. The elaborate greenhouse operation under Coutts and later his successor, George Saylor, produced cineraria, fuschia and geraniums—as well as birds of paradise that won annual awards at The Flower Show.

1. Perennial border along crenelated wall showing "Tower House."
2. Wall at east of garden showing statuary and Sinkler greenhouse.
3. Close-up of gate through crenelated wall.
4. East view of house-terrace. Pine now gone. Flower beds gone.
5. Old Sheaff greenhouse wall.

photos by Cortlandt V. D Hubbard

caroline sinkler's garden

Sinkler's plan, not an uncommon one, had two axes that formed four separate gardens, one of them a parterre surrounding a monumental sundial. The central axis was a long, broad lawn leading away from the terrace toward a suggestion of Sinkler's new greenhouse viewed through the gate. Crossing this, another broad lawn with a peek through a gate toward orchards to the north and a view of the exhedra to the south. This exhedra, a place outside the garden proper, was apparently unique in the area and was built to screen the barn.

The new garden had a basic structure of boxwood to replace the privet of Sheaff's time. The box was collected from friends and was carefully set out and transplanted on a regular schedule as it grew. A systematic program of feeding, spraying and pruning provided a vigorous plantation of undulating specimens, spicy and deep green, forming a background for many bright beds of bulbs and colorful bedding plants. Today, nematodes gnaw and bamboo invades what was once one of America's finest boxwood gardens.

Most of the two acres is enclosed by massive walls. One of these was developed by Sinkler from Sheaff's old lean-to-greenhouse. This, and one other in the same mood, combine with Sheaff's crenelated wall giving boundary to the garden.

Brick-edged and boxwood-lined paths traverse the plan, and formerly led through arbors and covered ways of pink and white roses, grapes and billowing wisteria. Every gardener knows what happens to neglected wisteria and growth is rampant now.

Statuary was everywhere, collected mostly in Italy as was the vogue. These were busts and complete figures, angels and medallions and a bird house on a marble standard, all strategically placed to enhance the plantings. An estate auction was held in 1970 after Mrs. Roosevelt died and the collection was dispersed. Today only remnants of pedestals and battered bases remain to suggest a formerly magnificent garden.

The current decay began when the Roosevelts bequeathed The Highlands to the state in 1970 to be enjoyed as a shrine and "for the benefit of the Commonwealth of Pennsylvania." The historic Georgian mansion became an albatross to the beneficiary.

A great variety of flowering trees were scattered among the locusts in the formal garden, providing bloom from spring through early summer. We recommend a visit at magnolia time, when several varieties of deciduous magnolias burst into bloom enabling one to visualize what the garden was like when colorful flowers embellished the green. The old balsam firs, mentioned by Downing, are gone; a majestic pine has been felled by a recent storm; but interesting specimens of metasequoia and Franklinia remain. The most venerable and impressive trees at The Highlands are the white oaks. One of these, nearest the house, bears a plaque noting that it was there when William Penn arrived in the area. Even at Downing's writing, it was the "conspicuous ornament of the grounds . . . a magnificent white oak, of enormous size, whose wide stretching branches, and grand head, give an air of dignity to the whole place."

a fourfold victim and its future

It has been said that the property as a whole at The Highlands is notable as a reflection of social life in America: the Federal era in which the house was built; the romanticism and neo-classical revival when the foundation of the garden was laid by George Sheaff; and, thirdly, post World War I when Caroline Sinkler was able to combine the best of the old with what was sensible for her own time.[2]

Now, the property has become a victim of a fourth period when the economics of maintaining such an establishment pose problems that sometimes seem impossible to solve.

The current decay began when the Roosevelts bequeathed The Highlands to the state in 1970, to be enjoyed as a shrine and "for the benefit of the Commonwealth of Pennsylvania." The historic Georgian mansion became an albatross to the beneficiary. Apathy and neglect changed it in just five years to a "Wuthering Heights." At this writing, a newly organized Highlands Historical Society has appealed to the Commonwealth to lease the property and has launched its own fund-raising campaign. It was in just this way that The Mount Vernon Ladies' Association preserved Mt. Vernon for us to enjoy today. Hopefully the Highlands Historical Society will find a solution — in time.

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[2] *Portrait of a Colonial City,* Harold Donaldson Eberline and Cortlandt Van Dyke Hubbard. J. B. Lippincott Co., 1939.



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photos by Edmund B. Gilchrist, Jr

The finished product

azaleas
IN CONTAINERS

by Phyllis Williams

Azaleas, trained or untrained, are among the best plants to grow in containers. You do not need a greenhouse to succeed. They are ideal for forcing for spring flower shows or for early spring display in the house.

In winter, they need a cold spot for storage. A root cellar, garage or enclosed porch will do. Just make certain they don't freeze on very cold nights. Brought into a sunny window they will bloom in two to four weeks and they will last in bloom for four to six weeks depending on the temperature. The cooler the house the longer they will last.

Very little water is required during storage, but they must never get bone dry.

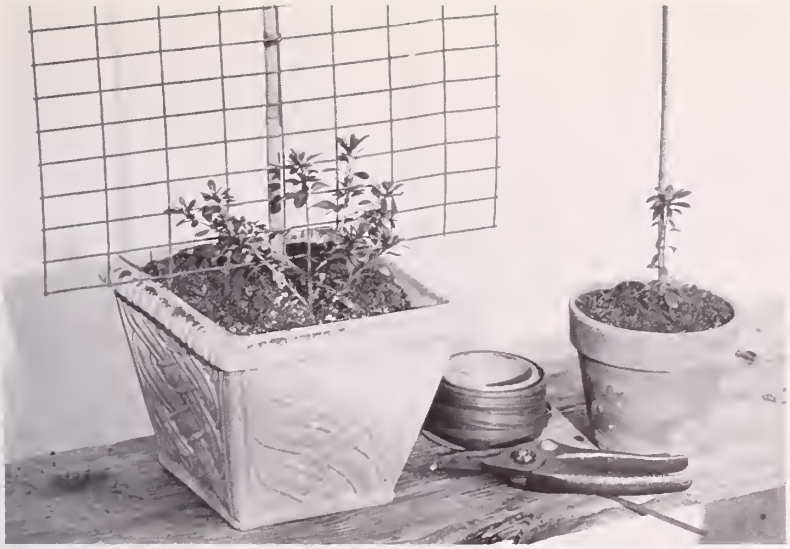
When forcing use tepid water, soak well and water only when soil is almost dry.

Some leaves will turn yellow and fall off during storage and when they first come in. Don't worry; it's normal and by the time they flower the plant will be nicely filled out.

When flowers fade, hold the stem just below each flower and pull off the whole thing making sure to get the three pistils in the center. This deadheading makes for a tidier plant and encourages new growth.

When spring comes azaleas can go out, the earlier the better barring frost. They stay out until late October or even November. They can always be tucked in a frost-free garage or shed for the coldest nights and put out again in the daytime. The longer they stay out the better.

Azaleas like a friable acid soil that



The start



This will need a good shearing in May.

includes generous portions of peat moss or better still leaf mold. They must never be planted too deeply as they will die unless roots are just under soil surface and they have a mulch of leaf mold.

The main pests are white fly and lace wing fly—these will not be a problem if the plants are sprayed the minute the first one appears. Watch the underside of the leaves.

One or two treatments with Metasystox-R or synthetic pyrethrum once a week for three weeks will eliminate them.

Azaleas are easily espaliered. A turkey wire form is recommended since it will last a long time. Draw a pattern on brown wrapping paper and fasten on the wire. Use heavy wire cutters to snip out the desired shape. Wire the form to a stout stake or two. Select a suitable pot keeping in mind the size and shape of your finished plant.

It is best to select the azalea to be trained when it is in bloom since it is helpful to know the size and color of the flowers. There are all sizes and shapes in the shops around Easter and Mother's Day. Often when you knock out the new plant you will be pleasantly surprised to find you have not one but three plants.

Fill your pot about half full of soil; settle your wire firmly and then set your plant at proper soil level with as many branches as possible flat against the wire. Finish planting.

Tie the branches with bits of old stockings or short twistems. Clip off the ones that will not lie flat. New growth will tie back easily. After a year or two you may shear it flat in June and July to keep it neat.

You can make a small tree by pruning a young plant or a rooted cutting to one stem and by tying it gently to a stake. It will grow straight up. Clip off any side shoots that occur below desired height. Allow new growth to form at top of stem. With an eye to symmetry pinch for two or three springs and you will have a nice little tree.

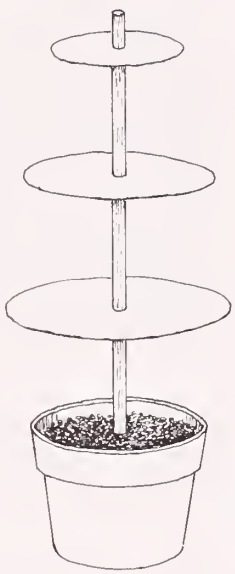
After the head has developed, in about June or early July each year, clip the top into the desired shape with scissors. Severe clipping provides neater and best appearance. Do not clip after July 21st as new growth and flower buds must be given time to form for the following year.

If you wish to have another tier select a young shoot nearest the stake and tie it as you did in the beginning. Allow it to reach desired height and then pinch it.

It is essential at this point to have the proper proportions in mind for the finished plant. Circles of brown paper impaled on a stake will help you select best heights and diameters of each tier (see illustration). Keep in mind the size of your container and the size of the flowers.

That is all there is to it. You do need some patience and timing but your final results will be worth the trouble.

Phyllis Williams has a small greenhouse crammed with plants. Some are trained and the old ones are pruned to keep them attractive and within bounds. She has won numerous ribbons with them. Many are now residing with other exhibitors and friends—too heavy to lift.



Brown paper circles help you select heights and diameters.



Topiary with a year to go

1. Pruning plants to simply make them fit a space is not the answer. Columnar English oaks *(Quercus robur fastigiata)* fit into this narrow planting area bordering a public walk. In this space these plants require little or no pruning.

2. Plants should act as markers and not barricades. A walk in the PHS garden shows the proper placement of plants in relation to a given space. Set back from the walk the Washington hawthorn *(Crataegus phaenopyrum)* provide a feeling of openness while providing an airy canopy overhead. Whether in summer leaf or winter fruit the feeling is one of seclusion without confinement.

3. The correct placement of the proper plant creates a pleasing design and harmony between plants and architecture. This white birch *(Betula alba)* fits well into the space allowed. Shadows playing against the blank wall of the building add extra interest in winter.

4. Plants may be spaced to create illusions. In the garden of The Philadelphia Contributionship, the strong lines of the horizontal groundcover beds and vertical lines of the trunks of ginkgo create an illusion of depth in a relatively small area.



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SPACE: *used or misconstrued*



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photos by author

by Ed Lindemann

PHS horticulturist Ed Lindemann is a landscape designer.

The arrangement of objects when creating a landscape design is not unlike the arrangement of furniture in interior design or clay in a piece of sculpture. Unlike furniture or sculpture, however, plant material is living and therefore changes shape. To complicate matters more, plants do not change shape or grow at the same rate. A single blade of merion blue grass grows rapidly, but remains quite small compared to the limb of a red oak that grows slowly but reaches a tremendous size eventually.

In planning and maintaining a land-

scape, as with any other form of design, we work with the basic elements of line, texture, color, size, shape and mass. Growth is the extra element to consider for a successful landscape design.

The whole concept of creating a landscape involves the correct placement of the plants. Walls, floors and ceilings designate the areas of an interior design. Out of doors specific areas are created by using plants as hedges, groundcovers, canopies and groupings. These act as points of interest, form line, give direction and provide visual, sound and physical barriers. Combined with architectural features, plant material should enhance, not obliterate, the structures it surrounds.

Unfortunately, many people choose plants for their garden the same way they choose a puppy, on an impulse of oblivious attraction. That cute little ball of fur grows up to be a 200 pound St. Bernard and the 3 ft. tall Norway spruce that came in a bushel basket as a live Christmas tree five years ago and was carefully planted by the front walk now makes entry through the front door impossible. With shears in hand the well-meaning gardener trims the spruce back so that passage is once again possible through the front door. Not realizing that the shearing has initiated the sprouting of many latent buds, the gardener finds that the following season there is twice as much shearing to be done. The process like an atomic explosion goes on and on. Before long the spruce, which if given enough space would now be a magnificent specimen, has been reduced to an unnatural sharply pointed green mass resembling a cement cone.

Don't get me wrong, pruning is an important aspect of gardening. A successful pruner is as much an artist as any sculptor. In "Pruning for Beauty" *(Green Scene,* July-Aug. '73), Frederic Ballard writes that the reason for pruning trees and shrubs is to make them beautiful. Ballard goes on to mention that there are exceptions such as pruning to improve the yield of fruit trees or to keep the foliage of street trees out of utility wires. Pruning plants simply to make them fit an area is not an answer to the problem. Selecting the appropriate plant to fit a given space is a much better solution. The best way to determine which plants are appropriate for a given space is to be observant; look around you and notice how the plants you have in mind have worked in other gardens especially in relation to their proportion and the space they occupy. Visit parks and arboretums, these are excellent locations to check on mature specimens both for size and seasonal appearance.

In addition to aesthetics, proper spacing is important because crowding makes plants more susceptible to disease. The more plants there are competing for water and nutrients, the more likely it is that many of them will function below par. Their weakened condition, plus reduced air circulation and light, permits the rapid spread of pests and disease.

Unfortunately, many people choose plants for their garden the same way they choose a puppy, on an impulse of oblivious attraction.

Economics also enters into proper spacing. Overplanting and the use of improper plants may achieve an immediately pleasing effect; however, it will soon be necessary to either prune the plants into unattractive geometric forms or to remove the material. Drive down any suburban street and you will see dozens of classic examples of what I am talking about. Usually the average gardener prefers to prune rather than remove a tree or shrub, the obvious reason being that the plant cost money, has increased in size and therefore in value and should not be discarded. Actually, the severe pruning decreases the value of the plant.

Unfortunately, no single reference source on proper spacing applies to every situation. Experience and observation are the best teachers. Here are a few suggestions to use as guidelines. When planting shrubs along the base of a building keep the center of the plant far enough away from the foundation to allow access to the walls for maintenance. Provide enough space for the plant to grow into its natural form. If small trees or large shrubs are used in a foundation planting consider their ultimate spread and space them accordingly. Most shrubs used for foundation plantings should be set in holes that are spaced 3 to 4 ft. away from the foundation of the building. Small trees and large shrubs should be 8 to 10 ft. away from foundation edges. The same rules apply to border plantings along walks, walls, drives or paved areas. For example, if it is decided that an azalea border is to be placed along a walk, consider the plant's eventual size. If the plants are 15 in.-18 in. specimens when purchased remember that these plants will be larger than 18 in. by the end of the first growing season.

Many people would set these plants approximately 12 in. from the edge of the walk giving a pleasing immediate effect. However, within several years the plants, if allowed to keep a natural shape, will hang over a large area of the path. Should there be a shrub border on both sides of the path, passage may be completely blocked over a period of time. If the plants had been planted in holes 3 ft. from the edge of the walk they would mature into their natural shape without competing for space.

In addition to the spread and width of plants, height is another factor in spacing. Upright or columnar type plants used at the corners of buildings or at entrance ways should be chosen to stay in balance with the proportions of the building or doorway. If you desire a plant 6 ft. tall on either side of your front door, choose a plant with a maximum height of 6 to 8 ft. Don't start out with a 6 ft. specimen that will eventually reach 25 ft.

Plantings at the entrances to walks and driveways should be aesthetically pleasing, indicate the traffic pattern and act as markers not barricades.

The designer can create illusions of space by carefully placing plants. Plants spaced to create a strong line such as a hedge, border or allee give the illusion of depth. The height of plants either overhead or within an area can control the illusion of the size of a space. It doesn't matter if the garden is formal or informal, or whether you want to create a specific effect through the use of illusion or to create a strictly functional garden, the key to a successfully designed landscape is proper spacing. The space is yours to work with; use it constructively, do not misconstrue it.

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photo by Robert S. Halvey

A view of the medicinal garden features *Tropaeolum majus* (nasturtium) (foreground).

it's two hundred years late, but . . .

HAPPY BIRTHDAY, PENNSYLVANIA HOSPITAL

On June 7, 1774, physicians at the Pennsylvania Hospital attended the meeting of the board of managers, and heard a proposal to establish a Botanical Garden at the hospital. In colonial days the physician's pharmacopoeia consisted of "simples" made from the roots, barks, stems, and leaves of herbs, both herbaceous and woody. The practice of medicine depended largely on the herbals written by John Gerard *(The Herball or Generall Historie of Plants* [1597]), Nicholas Culpepper *(The Art of Simpling* [1653]), and others. The physicians serving on the board of managers wrote:

Gentlemen—we are pleased with your proposal generously to execute a plan of a Botanical Garden formerely agreed upon for the benefit of the Pennsylvania Hospital, which we think may be made useful to that noble institution and it appears to us that the present Garden and Lot of Ground Northward of the Hospital, within the Square, will be most fit for the purpose.

We doubt not that you will join in opinion with us that the sooner a skillful Botanical Gardener is engaged the better.

We are Gentlemen, Your very ready Friends.

Thomas Cadwalader
Thomas Bond
William Shippen
John Redman
John Morgan

For many reasons, the botanical garden did not become a reality until 200 years after the original request. Now Pennsylvania Hospital has its Medicinal Garden—located on the southeast corner of Ninth and Pine Streets, within the hospital walls.

The creation of this historic garden



by Sallie Harvey

Sallie Harvey is a third year student at the Barnes Arboretum. A member of the Garden Workers, Harvey worked on the committee to put in the medicinal garden at Pennsylvania Hospital.

is one of three bicentennial projects of the Philadelphia Committee of the Garden Club of America. The committee consists of ten member clubs in the Delaware Valley, affiliated with the national organization.

The design of the garden, conceived by Martha Ludes Garra, horticulturist and consultant, follows a circular motif. This form carries through the theme of the Circular Room, the original circular surgical amphitheater atop the Pine Building. The planting beds border a center circle, and they themselves are subtended on two sides by woodland areas, containing trees, shrubs and groundcovers.

The list of medicinal herbs is long since the early settlers used both herbs of the Old World as well as herbs introduced to them by the American Indian. The problem was to limit the choice to those plants most important to medicine in 1774, and also their adaptability to a city environment. After much discussion we arrived at a plan pleasing to the eye, but not necessarily an authentic study garden of the 18th century.

Many of the lovely native trees and shrubs found in our gardens today are included in the medicinal woodland. (The full effect of the woodland is not yet apparent; the plant material will fill out in time and create a more woodsy effect along the wall.) Included in the garden are the Washington thorn *(Crateagus phenopyrum),* the bark, bloom and fruit of which were used as a cardiac tonic, diuretic, and astringent. An oil extract from the fruit of the common juniper, *Juniperus virginiana,* was used as a stomachic, and as a topical ointment. The bark of the flowering dogwood, *Cornus florida,* contains a substitute for quinine. Others included are mountain laurel *(Kalmia latifolia),* bayberry *(Myrica pensylvanica),* box *(Buxus sempervirens)* and Scotch broom *(Cytisus scoparius).* Other medicinal herbs are used as underplantings and ground covers for trees and shrubs:



photo by Ross Pilling

Allium tuberosum

lily of the valley *(Convallaria majalis),* used as a cardiac tonic and diuretic; bloodroot *(Asarum canadense),* important as a remedy for nervous afflictions; and twinleaf *(Jeffersonia diphylla).* Ginseng *(Panax quinquefolius)* is in the woodland garden. Its use enjoys a renaissance today and supposedly ensures "long life." *Colchicum autumnale* continues to be used as a source of colchicine, a component of medicines for gout. (See "Colchicum, the Potent Flower," *Green Scene,* Sept., 1974.)

The planting beds that comprise the core of the garden repeat the circular theme. They are defined by low evergreen hedges of the santolinas, both *Santolina chamaecyparissus* and *Santolina virens.* These herbs are highly aromatic, used not only as worm tonics, vermifuges, but also to repel insects. They were strewn on the floor, or carried in "Tussie-Mussies." Perhaps their overpowering aromas were their best quality. Other herbs used as aromatics, and found in the garden, are lemon balm *(Melissa officinalis),* costmary *(Chrysanthemum balsamita),* lavender *(Lavandula spica* 'Hidcote'), sage *(Salvia officinalis nana),* and tansy *(Levisticum officinale).*

One of the most attractive features of the center garden areas is the contrast of textures. The bold leaves of comfrey and clary sage *(Salvia sclarea)* are a focus. Comfrey *(Symphytum officinale)* traditionally known as Saracen's root is believed to have been brought to England by the returning crusaders. Its root has been used medicinally as a bone setter, for chest congestion, and as an ointment for open wounds. Clary sage, blooming in July, features a spike of delicate colored yellow-pink flowers. To the other extreme is the fluffy, feathery texture of southernwood *(Artemesia abrotanum)* also known as ladslove or maidens ruin, because it supposedly encouraged the growth of hair. Other artemesias may be found: wormwood *(Artemesia absinthium)* and dusty miller *(Artemesia stelleriana).* Many other favorites may be found in these areas: my lady's mantle *(Alchemilla vulgaria),* the alliums *(Allium tuberosum* and *Allium cernuum),* butterfly weed *(Asclepias tuberosa),* feverfew *(Chrysanthemum parthenium)* and perhaps most important of all foxglove *(Digitalis purpurea).*

Much of the plant material has been given as memorials by the ten member garden clubs, and by friends of the Pennsylvania Hospital, including both physicians and other staff members. Without their interest and support, this garden would not have become a reality.

This garden not only expresses our best wishes to the hopsital on the 225th anniversary of their founding, but we hope also provides a continuity to future generations in the study of ways nature has helped the physician—in a setting of serenity.

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how I learned to love my



photo by author

At one time when spring arrived, I reacted much the same as my neighbors did—or do. With a mixture of thanksgiving and dismay; thanks because the winter was finally gone and dismay because I had so much to do.

One of the most odious jobs that never seemed to go away was dealing with the cursed dandelion.

Known just about all over the world by any one of possibly 50 common names including blowball, doon-head, clock, piss-a-bed, and others much less complimentary, *Taraxacum officinale* has been used since the days of ancient Egypt for one reason or another. The dandelion, a corruption of the French word *dent de lion,* which alludes to the leaf margins, has been listed in just about every herbal printed as an effective laxative, diuretic, tonic, hepatic, and stomachic.

But to many of us, it's just the plain old dandelion—a weed—and we have to deal with it one way or another.

The dandelion is not easy to get rid of, as generations of gardeners have discovered. The most obvious solution to the problem is the many herbicides on the market today. Some include dacamine D, dicamba, DNBP, EDEP, potassium cyanate, 2,4-D, 2,4,5-T and 2,4,5-TP. Simply sock it to the rogues in early spring and you'll have a dandelion-free lawn in springs to come if, and this is a big if, all of your neighbors jump on the chemical bandwagon themselves and help control it too.

If they don't you're fighting a losing battle since about the time you're ready to gloat over your victory, that old broad-leafed weed will poke its head out of the ground and you'll be just about back where you started from, lawn deep in dandelions.

dandelions

by Michael J. Clark

Michael J. Clark is a science writer and photographer for Rodale Press. He is an avid amateur horticulturist and writes frequently on garden subjects as a free-lancer. He is a member of the American Garden Writers Association and is the former gardening columnist for the Philadelphia Inquirer.

If you can't get rid of them, use them.

How? Any number of ways.

Many of the people we know and respect look up to the French for their cooking skills. In spring, or from February onwards, the roadsides outside the cities of France are clogged with people gathering wild plants for salads or for cooking and serving them like spinach. What are they looking for? Dandelion greens, that's what.

Put the early spring greens in salads or use them as a substitute for lettuce on sandwiches and you won't go wrong. Besides tasting fantastic, the greens are loaded with many nutritious extras. In fact, the greens are said to have enough iron in them to provide an effective antidote for anemia. If you haven't sprayed your lawn to kill the dandelions, chances are good that they will be good too. If, however, you've sprayed them with any chemical at all, I'd leave them alone and wait till next year. Dandelion salads are not worth the chance.

Salads aren't the only thing you can use these weeds for. In the 1974 publication, *The Complete Book of Herbs* (Macmillan Publishing Co., Inc.), Kay N. Sanecki points out that at one time, dandelions were actually a cash crop.

This phenomenon, which causes consternation among bona fide dandelion haters, occurred in Germany before World War I. Approximately four pounds of seed per acre were sown to produce about four to five tons of roots by the second fall. The roots were then roasted and sold as dandelion coffee for a good price.

To make coffee from the roots, roast them until they are nut brown all the way through. Grate them and they can be used either as a coffee stretcher or even as a substitute much the same as chicory was once used.

Dandelion coffee is not exactly a staple item on the home menu, but then dandelion facials aren't common either. Before many of the cosmetic companies did all the work, dandelion leaves were ground up, mixed with water to form a paste, and applied as a facial.

You probably don't have to go that far, however, in order to make use of your dandelions. Simply putting the greens into salads in the early spring will be sufficient to relieve part of the misery of a lawn full of dandelions. And what's nice about that is that you can expect three or four harvests a year.

Once you've had all the dandelion salads that you want, we recommend cooking them like spinach. If they seem too bitter for your taste, change the water after they've been boiled the first time. Then boil again and the bitter taste will have disappeared.

In early spring, before the flowers set, the young dandelion root can be cooked and eaten like carrots.

Just about every use for dandelions comes in early spring. Once the flowers are mature, their use is limited. About the only thing that you can use them for is to make dandelion wine, for which numerous recipes exist. And you need very little equipment to make a decent job of it. (See box.)

The first time I paged through a seed catalog and noticed dandelion seeds for sale, I couldn't believe my eyes. Unless you're a glutton for punishment, don't bother ordering the seeds. Simply use what you have on your lawn. It's about the only thing that's free these days.

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dandelion wine

Here's a recipe from *Cooking With Flowers* by Zack Hanle and Donald Hendricks (Price/Stern/Sloan Publishers, Inc., 1971) that calls for absolutely no special know-how and does not require the usual exotic equipment normally used to make wine.

- 2 quarts dandelion blossoms
- 4 quarts water
- 1 cup orange juice
- 3 tbs. lime juice
- 3 tbs. lemon juice
- 3 tbs. coarsely chopped fresh orange rind
- 1 tbs. coarsely chopped fresh lemon peel
- 8 whole cloves
- ½ tsp. powdered ginger
- 3 lbs. granulated sugar
- ¼ cake compressed, dried yeast dissolved in
- ¼ cup of warm water

Try for flowers from an open field but your backyard variety will do just as well if you haven't sprayed them. Pick them early in the season. Use only the flower heads.

Place the blossoms (washed in clear water) in water with orange, lemon and lime juice. Add the citrus rinds, cloves, ginger, and sugar. Bring to a boil and continue to boil for an hour. Strain through filter paper and cool. While it is warm (and not hot), add yeast and let it stand overnight. The next day pour it into bottles and put in corks after about three weeks, or longer. Don't put them in too soon or you're likely to wind up with empty bottles and corks flying all over your basement.

FROM SEED TO FLOWER
Philadelphia 1681 – 1876
A Horticultural Point of View



by Julie Morris

An advertisement appeared in the Philadelphia daily newspaper: "Those persons desirous to form a Horticultural Society are requested to meet at the Franklin Institute, South Seventh Street, on Saturday next [November 24, 1827] at 12 o'clock, precisely." The meeting led to the founding of the oldest ongoing horticultural society in America.

The founders of the Pennsylvania Horticultural Society and its members were among those who established Philadelphia's importance in early American horticulture. The celebration of this country's bicentennial would be incomplete without focusing on the significant role played by the Philadelphia horticulturists in the emerging nation. That is why the Pennsylvania Horticultural Society will present a major exhibit of rare early horticultural books, which will be staged April through October, 1976.

Starting with William Penn, a vigorous proponent of horticulture with his plan to develop Philadelphia into a "fine green Countrie Towne," and continuing with John Bartram, the farmer botanist whose plant explorations began the transit of seeds and plants between America and Europe. The exhibit will highlight the contributions made by the botanists, explorers, nurserymen, seedsmen and gardeners from 1681 until the Centennial in 1876.

To demonstrate the impact made on early American horticulture by the many botanists and horticulturists of colonial times, the Society has assembled books written, published and used by Philadelphians in the last half of the eighteenth and first half of the nineteenth centuries. We know about the early plantsmen from their letters, journals, catalogues and treatises, samples of which will appear in the exhibit. To aid in the understanding of these materials PHS has prepared a catalogue to accompany the exhibit.

The catalogue contains information that has not been correlated elsewhere. It is the first chronicle of Philadelphia's horticultural greatness. The catalogue will be a permanent record not only of a significant bicentennial exhibit but of the people whose lives and works we have chosen to illustrate—the people who persisted through difficulties and hardships and laid the foundations of the horticulture we enjoy today.

The exhibit and catalogue have been a three-year ongoing project of the PHS staff and the Society's talented and committed Library and Exhibits committees. How innocent we were! The task of narrowing the numbers of titles, easily more than 100, down to a manageable size was formidable. However with the guidance of Elisabeth Woodburn, an expert in antiquarian horticultural literature, and Professor Joseph Ewan, the foremost botanical historian in America, we selected a list of 38 titles.

Professor Ewan was asked to assist also in preparing a catalogue for the exhibit. The Society's Exhibits Committee then focused on the best way to exhibit the 38 books, adding artifacts, charts, models, maps, plants and all sorts of material to bring the books to life.

Unplanned for benefits. After the books were selected it became evident that most of them needed considerable repair before they could be exhibited safely. The restoration program has included not only repair and rebinding but deacidification of the highly acid paper used to print books after the first quarter of the nineteenth century. It is a harsh reality that many libraries will lose most of the nineteenth century as the acid in the paper and bindings destroys volume after volume! Thus, PHS's restoration program will preserve a body of literature that may someday become unavailable in other libraries except on microfilm.

It is somewhat mind-boggling to me to realize that the very books we are restoring were written and *used* by the people we will highlight in the exhibit: we have the Landreths' seed catalogue of 1832; Thomas Hibbert and Robert Buist's *American Flower and Garden Directory,* 1832; Hoffy's *Orchardists Companion,* dedicated and presented to the PHS in 1841; and Thomas Meehan's own copy of *The American Handbook of Ornamental Trees,* 1853. These men and many others in the exhibit sat on the governing board of PHS, exhibited in numerous PHS plant shows where they introduced new plants to the gardening public: camellias, poinsettias, dahlias, among hundreds of others. They were members of the Society, and their books were here in the library and remain as records of their achievements.

It is a harsh reality that many libraries will lose most of the nineteenth century as the acid in the paper and bindings destroys volume after volume! Thus, PHS's restoration program will preserve a body of literature that may someday become unavailable in other libraries except on microfilm.

Many of the books chosen for the exhibit represent American firsts: Humphry Marshall's *Arbustum Americanum,* 1785, was the first book written on American paper using American ink about American plants. As if that isn't enough the *Arbustum* contains the first written account of the famous *Franklinia alatamaha.* Jacob Bigelow's *American Medical Botany* is one of the very earliest colorplate books; B. S. Barton's *Elements of Botany,* 1803, was the first book on botany published in America and of course we include M'Mahon's *American Gardener's Calendar,* 1806, the first complete gardening book. Small wonder Philadelphia was the horticultural mecca for visitors from abroad in colonial times!

To continue the firsts: Much of the material selected as illustrations for the catalogue and exhibit has never, or rarely, been reproduced until now. For

books and the green world

photo by Edmund B. Gilchrist, Jr



Rhubarb leaf print by Joseph Breintnall, 1738

example, there are photographs of dried plant specimens collected by John Bartram in New Jersey and Pennsylvania; a rare reproduction of a copy of the broadside catalogue issued by John Bartram, Jr., *circa* 1783; a copy of the title page from the first account of grape-growing in America in the *Transactions of the American Philosophical Society,* 1771, predating the first book on grape-growing by 50 years.

A research assistant, Susan Milius, spent the summer of 1974 gathering information to provide background information to the Exhibits Committee. Her work furnished many tidbits of information: we know rhubarb was grown as early as 1738 from a leaf print made by Joseph Breintnall, and we have evidence of American enthusiasm for establishing a silk industry from Watson's *Annals.* Early maps and business directories guided Philadelphia artist Ann Ku in her fine map. The map of places of historical horticultural interest is part of the catalogue and will appear as a blow-up in the exhibit.

PHS members preview. PHS members will be invited to a special preview before the April opening. Paperbound editions of the catalogue* will be available. In addition, a limited hardbound deluxe edition of 250 copies, each of which will be numbered and contain a hand-colored map, will be available.

The books in the exhibit are a product of a time when people were in touch with nature as an essential part of their daily lives. A time when able people could aspire to learn most of what was known about nature and to add to the stock of human knowledge by their own observation and deduction. A time before specialization and standardization, when individuals had the confidence to form their own views and to debate them with their peers. If the exhibit helps its viewers to understand life in the Revolutionary period and our first century of independence a little better, it will have achieved its objective.

*The name of the catalogue is *From Seed to Flower, Philadelphia 1681-1876, A Horticultural Point of View.*

books in the exhibit

(listed chronologically)

Observations & c., John Bartram, London, 1751.

Essay on the Cultivation of the Vine, American Philosophical Society Transactions, Philadelphia, 1771.

English Flora, Richard Weston, London, 1775.

Catalogue of American Trees, Shrubs and Herbacious [sic] *Plants,* John Bartram, Jr., Philadelphia, *c.* 1783.

Catalogue d'Arbres et Arbustes et Plantes Herbacees d'Amerique, William Young, Paris, 1783.

Arbustum Americanum, Humphry Marshall, Philadelphia, 1785.

Hortus Kewensis, William Aiton, London, 1789.

Travels through North and South Carolina, East and West Florida, William Bartram, Philadelphia, 1791.

An Inaugural Botanico-Medical Dissertation on the Phytolacca decandra of Linnaeus, Benjamin Shultz, Philadelphia, 1795.

Elements of Botany, Benjamin Smith Barton, Philadelphia, 1803.

An Epitome of Mr. Forsyth's Treatise on the Culture and Management of Fruit-trees, edited by "An American Farmer," Philadelphia, 1803.

Gleanings from the Most Celebrated Books on Husbandry, Gardening, and Rural Affairs, Anonymous, Philadelphia, 1803.

The American Gardener's Calendar, Bernard M'Mahon, Philadelphia, 1806.

A View on the Cultivation of Fruit Trees, William Coxe, Philadelphia, 1817.

Vegetable Materia Medica of the United States, William Paul Crillon Barton, Philadelphia, 1817-1818.

American Medical Botany, Jacob Bigelow, Boston, 1817-1820.

The Genera of North American Plants, Thomas Nuttall, Philadelphia, 1818.

A Flora of North America, William Paul Crillon Barton, Philadelphia, 1821-1823.

Florula Cestrica, William Darlington, Philadelphia, 1826.

Periodical catalogue of green-house and hardy herbaceous plants and shrubs, etc., of D. and C. Landreth, Philadelphia, 1832.

American Flower Garden Directory, Thomas Hibbert and Robert Buist, Philadelphia, 1832.

Catalogue of Splendid and Rare Green House and Hot House Plants, To Be Sold By Auction, At Lemon Hill, D. & C. Hill Auctioneers, Philadelphia, 1838.

American Manual of the Mulberry Trees, Constantine Samuel Rafinesque, Philadelphia, 1839.

The Orchardist's Companion, Alfred Hoffy, ed., Philadelphia, 1841.

The Rose Manual, Robert Buist, Philadelphia, 1844.

Illustrations of Medical Botany, Joseph Carson, Philadelphia, 1847.

The Fruit and Fruit Trees of America, Andrew Jackson Downing, New York, 1847.

The American Pomologist, William D. Brincklé, ed., Philadelphia, 1851.

The Theory of Horticulture, John Lindley, New York, 1852.

Philadelphia Florist and Horticultural Journal, R. Robinson Scott, ed., Philadelphia, 1852-55.

The American Handbook of Ornamental Trees, Thomas Meehan, Philadelphia, 1853.

Victoria regia, John Fisk Allen, Boston, 1854.

American Gardener's Calendar, Bernard M'Mahon, rev. ed., John Jay Smith, Philadelphia, 1857.

The Gardener's Monthly, Thomas Meehan, ed., Philadelphia, 1859.

North American Pomologist, Alfred Hoffy, Philadelphia, 1860.

Both Sides of the Grape Question, William Saunders, *et al.,* Philadelphia, 1860.

The Book of Evergreens, Josiah Hoopes, New York, 1868.

Cranberry Culture, J. J. White, New York, 1870.

●

growing interests

Share your growing secrets with other members.

We'd like to have articles from our members for the Growing Interests section. Tell us about your favorite plants, particularly if they're a little off the beaten track. We're interested in both indoor and outdoor plants.

Tell us why you like that particular plant, how you grow it and what some of your problems have been and how you solved them, if you have.

Manuscript should be approximately 250-300 words (1-1½ pages, typewritten, double-spaced). The article should deal with only one kind of plant, not several species or genera.

Black and white photos preferred; however, we might be able to change a slide to black and white. Call or write Jean Byrne, editor, WA 2-4801, PHS, 325 Walnut Street, Philadelphia, Pa. 19106.



photo by John Gyer

John S. Kistler is a landscape architect who has worked on the restoration of Lemon Hill in Fairmount Park. He designed the 1975 PHS Harvest Show and the 1976 Flower & Garden Show. He is especially interested in rock garden plants.

vegetable spaghetti

The most popular vegetable that we have been growing is one that I originally bought as spaghetti squash. (My son, Matthew, entered it under that name in the Havest Show.) However, in the Burpee's exhibit at the Harvest Show it was labeled vegetable spaghetti, as are the seeds we purchased from the Park Seed Co.

Its habit of growth, leaf and bloom seem identical to a squash vine. It is a creeping, spreading vine as aggressive as pumpkins. We planted it in a row in an open sunny field plot and kept moving, or training, the runners back along the row line to enable rototiller cultivation for much of the season.

The fruit has a firm thin white skin with thick light green "flesh" inside. The flesh, when cooked, is easily lifted out with a fork, not in chunks, but in strips of pale green spaghetti. These strips run radially around the center seeds rather than from end to end. It grows to almost football size, with blunter rounded ends.

Anita first tried young "tender ones." These were just boiled until soft, cut in half, lengthwise, seeds discarded and served with butter on top. Later she sliced them through into ½-in. cartwheels and sauteed them in oleo. Our children immediately gave up all other squash after that. When the vines were at their peak, they out-produced our appetites, so she tried boiling the large "mature" fruit. These were equally as good as the younger ones. One half, cut lengthwise, filled to overflowing with spaghetti and meat sauce, makes a delightful and now favorite meal without the worry about too much starch!

Regarding the keeping qualities, we cannot say how well it stores in the winter. (It is so popular that neighbors would buy any we did not eat. One neighbor's guest from New Jersey wanted to buy 20.) However, we did hoard a few in a shed and enjoyed them through October.

Next year we hope to put in an early (end of May) and a late (end of July) planting to see if we can grow enough, and try to store some for the winter. I might, maybe, even try it on a fence to see if it is as happy when confined. Try it; I'm sure your waistline will also profit by it.

John S. Kistler

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Beginning with the May issue of *Green Scene* the minimum rate will be $10 for the first 35 words and 20¢/word thereafter. Less 10% discount for two or more consecutive issues, using same copy. We will honor previous commitments made at the current rates; changes will be effective at renewal time.



Daylily, Little Rainbow.
See story on page 7.

THE
green scene
HORTICULTURE IN THE DELAWARE VALLEY
MAY • JUNE • 1976 $1.00



Franklin H. West
writes about rhododendrons.
See page 1.



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THE
green scene

HORTICULTURE IN THE DELAWARE VALLEY

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Back Cover: photo by Léonie Bell

rhododendrons
IN THE DELAWARE VALLEY



Mrs. Furnival

photos by author

by Franklin H. West

Franklin West is a practicing psychiatrist and teacher at Hahnemann Medical College. He is president of the board of trustees of Tyler Arboretum.

The word rhododendron literally means rose tree. Although rhododendron flowers may be as colorful as roses, and some just as fragrant, the resemblance ends there. Rhododendrons and their azalea cousins are the most spectacular evergreen flowering plants growing in Delaware Valley. They bloom, depending on variety, from March to August, in every color except pure blue. They come in every imaginable size and shape, from dwarf to tall, with large leaves or small, some with furry indumentum on their undersides, others with a pungent fragrance when rubbed. And some rhododendrons actually lose all their leaves in the winter.

Before 1876, the only rhododendrons one could grow in this region were the species native to the eastern United States: the small leafed *R. carolinianum,* the southern Appalachian *R. catawbiense,* and the rosebay rhododendron of the north, *R. maximum.* This situation was dramatically changed at the time of the Centennial Exposition in Philadelphia,

continued

rhododendrons continued

when 1500 hybrids, the fruit of 60 years' breeding work in England, were imported from the Anthony Waterer Nursery in Surrey and planted in Fairmount Park. (Many of these original plants are still growing there. One large group can be seen from Belmont Avenue just opposite the statue of Columbus.) These hybrids were produced by combining the genes of our Catawbiense with those from Oriental and European species that had brighter and more intense colors. Most of these Waterer hybrids are now referred to as the "old ironclads" because of their great hardiness and dependability. Although their flower and truss size suffer by comparison with present day hybrids, they were an instant success in 1876, and were widely planted in the northeast. The largest of these are now at least 20 ft. tall and 15 ft. across!

In the 100 years since the Centennial rhododendron display, plant explorers and hybridizers have collected and created a vast multitude of varieties for garden use. Most of the species were found in the mountains of southeast Asia, growing at altitudes of 4,000 – 18,000 ft., where summers are cool, rainfall heavy, and the plants are bathed in mists or buried in snows that protect them from extremes of weather. Species that came from Korea, Japan, and Coastal China adapted quite well to our conditions; the rest did not.

Unfortunately for us, the first rhododendron hybridizers did their work in the British Isles, Belgium, Holland, Germany, and later in our Pacific Northwest. The climate in all these places is closer to Asia's than ours. Many of these new creations performed beautifully on their home grounds, but failed to make it in Delaware Valley. Hobbyists had to discover through trial and error which hybrids were good enough to stand our hot summers, moderate rainfall, and cold, snowless winters. The rhododendron ratings published by the American Rhododendron Society do not have the same nationwide significance that the all-America selections have in roses. There won't be an all-America rhododendron selection until they are bred for greater adaptability.

The answers to the problem of rhododendron selection for the eastern United States has to come from hybrids developed here, where only the fittest can make it from seedling stage to full flowering after five or six years of full exposure to our climate. Fortunately for us, there have been many imaginative, persistent plantsmen working to develop hybrids that adapt well in the eastern states. Thanks to men like Joseph Gable of Stewartstown, Pa.; Charles Dexter at Sandwich, Mass.; Guy Nearing in Ramsey, N.J.; Orlando Pride of Butler, Pa.; Tony Shammarello near Cleveland; David Leach of North Madison, Ohio; Donald Hardgrove on Long Island; Edmund Amateis at Brewster, N.Y.; Charles Herbert near Valley Forge; and John Wister of Swarthmore, we have a treasure trove of rhododendron species and hybrids of proven value for our climate. There are hundreds of rhododendron hobbyists both in the United States and Canada continuing this hybridizing effort, hoping to add their own creations to the growing list of superior varieties. The hybridizers have accomplished in 100 years what natural selection, continental drifting, and the pollinating of the bees could not produce in multimillenia. And there is still a great deal more to be done.

Given the right growing conditions, these eastern bred rhododendrons thrive on neglect. They rarely require fertilizers, fungicides, or insecticides.

What are the right conditions? Their



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basic requirements are: light, shade, well-drained acid soil rich in humus, and the soil surface covered with 2 to 4 in. of organic mulch. The shade to the north or east sides of a house or evergreen tree is especially congenial to rhododendrons, unless the roof overhang keeps the soil too dry. For the same reasons, land that slopes to the north or east is much more hospitable to rhododendrons than south or west slopes. Wind protection is just as important as sun shading when picking a spot to plant your new selections.

These plants have compact, shallow roots that hold the soil firmly. Consequently, they make their own root ball when they are dug up. Transplanting can be done easily whenever one has the time and labor available, except for June, July, and August when it is best to leave the plants alone. The thing to remember when planting or transplanting rhododendrons is to set the plant in the ground so that the *top* of the root ball is level with the ground. Fibrous roots need to breathe, and planting too deeply actually suffocates them. Newly planted rhodies take two or three years to really lock their roots into the soil, and during this period they are quite vulnerable to water lack. Fortunately, they sound a loud alarm when thirsty. The leaves curl and droop in the same way they do in winter when the temperature drops below 30° F. Deep watering and the deep mulch to conserve the added moisture meets their needs. Hobbyists will usually say that fertilizing isn't necessary, although it is a good idea to apply superphosphate and iron sulfate every three or four years to favor maximum flower bud production and good leaf color.

Diseases are so unusual that they are hardly worth mentioning. If you think you have trouble, a well-balanced rose spray will be perfectly safe to use on your rhododendrons. If a branch or twig dies back, prune it out and throw it in the trash to prevent spreading the trouble. Azalea petal blight can be a problem on rhododendrons, too, but only when May is very warm and wet. Spray control for this condition is imperfect and expensive.

Prune rhododendrons? Definitely! After all, nature has been pruning rhododendrons for a long time, using fire, freezing, flowering and fungi to cause latent buds below the affected area to sprout and restore the bush to its former glory. So don't hesitate to prune your plant into the shape you desire. The best time to prune is in the spring just before the new growth appears. Legginess can be prevented in some plants if you snap off the vegetative buds just as they swell. Three or four side buds will grow just below the one you snapped off. This useful technique is called "thumb pruning." The other pruning that is advised is called deadheading; you break off the spent floral trusses just above the whorl of leaves. If petal blight was present, put the deadheads in the trash instead of adding them to the mulch where the spores would overwinter and redouble the problem the following year. By preventing your plants from setting seed, you will encourage them to set a greater number of flower buds, which develop in July and August. They become much rounder and fatter than the thinner, more pointed vegetative buds by fall.

Rhododendrons are divided into two large categories. The familiar large-leafed sorts that flower in large clusters or trusses, and the smaller leafed kinds (with scales on the underneath sides of the leaves) that have smaller blossoms appearing singly or in small clusters. Most of these scaly leafed varieties, called lepidote rhododendrons, prefer to grow in the same sunny places that azaleas thrive in. It is a shame that these small-leafed gems are not well known by the average gardener, since most of them bloom brightly in April and are very compatible with daffodils and other spring bulbs. The first of the large-leafed sorts bloom in April, and by proper selection one can have rhododendron flowers until July 10 or 15.

Selection of varieites is so much a matter of personal preference that your best advice is to try to see how well they perform here before you buy. The two local chapters of the American Rhododendron Society have a two-acre display garden at Tyler Arboretum where they have planted commercially available varieties of superior merit for this region. The Princeton Chapter has its display garden at the Hun School in Princeton. One can also see spectacular plantings of rhododendrons at the Morris, Tyler, and Barnes Arboreta, at Swarthmore College, and at the beautiful Wister garden nearby, and finally at Swiss Pines near Phoenixville and in Charles Herbert's garden on Diamond Rock Hill above the Phoenixville Country Club. Once you have seen how overwhelmingly beautiful a rhododendron garden can be, I am sure you will be inspried to plant some on your home grounds.

Where to buy? There are a few backyard rhododendron nurseries run by hobbyists that offer the best adapted plants for your garden. General nurseries and garden shops also provide wide assortments. One can buy small plants (one year old cuttings) very cheaply,

continued

and grow them to bloom-size in three or four years under lath shade. Ordering plants from the Pacific Northwest by mail can be something of a gamble unless you know for sure that your selections do well here.

Once you have gotten rhododendronitis, you will be rooting your own cuttings, swapping plants and cuttings with other members of your American Rhododendron Society Chapter,* growing them from seeds, and perhaps most exciting of all, doing your own hybridizing. But please don't let your rhododendron fever cause you to ignore the azalea end of the family.

Here is a prejudiced list of my personal selections of fine rhododendrons for you to consider for your Delaware Valley garden. The blank spaces offer many opportunities for tomorrow's hybridists to work on. The names in parentheses commemorate their predecessors who created these fine plants.

*If you would like information about membership in the Philadelphia/Valley Forge Chapters of ARS, write to:

R.D. 1, Kresson-Gibbsboro Road
Marlton, New Jersey 08053

New Jersey Chapter:

Alan S. Cook, Secretary
19 Millcrest Road
Cedar Grove, New Jersey 07009

New York Chapter:

Mrs. Walter McKay
55 Ninth Avenue
Kings Park, New York 11754

Potomac Chapter:

Mrs. R. H. Goodrich
10015 Saddle Road
Vienna, Virginia 22180

Princeton Chapter:

Ross C. Wilcox
161 Ridgeview Circle
Princeton, New Jersey 08540

Scaly Leafed (lepidote) Rhododendrons (mostly dwarf, 1 ft. to 3 ft.)

	Early March + April	Midseason May 1 - June 1	Late June 1 - July 10
Species			
White	*R. dauricum* *R. racemosum*	*R. carolinianum*	
Pink	*R. mucronulatum*	*R. carolinianum*	*R. minus*
Magenta	*R. dauricum*		
Yellow	*R. keiskei*		
Hybrids			
White	Dora Amateis (Amateis) Brandywine (Nearing)		
Pink	Anna Baldsiefen Conewago (Gable) Pioneer (Gable) Windbeam (Nearing)	Myrtifolium	
Purple-Magenta	P.J.M. (Mezzitt) Purple Gem (Nearing) Ramapo (Nearing)		
Bluish	Blue Diamond (Crosfield) Blue Tit (Williams)	Augfast (Magor)	
Yellow	Mary Fleming (Nearing)		

Large Leafed (elepidote) Rhododendrons (plants large, 6 ft. to 10 ft., except as noted, in 20 years)

	Early March + April	Midseason May 1 - June 1	Late June 1 - July 10
Species			
White		*R. vernicosum* *R. yakusimanum* (dwarf)	*R. auriculatum* *R. discolor* *R. maximum*
Pink	*R. adenopodum* *R. praevernum* *R. vernicosum* 18139	*R. fortunei* *R. metternichi*	*R. maximum*
Red			*R. maximum rubrum*
Yellow		*R. wardi*	

	Early March + April	Midseason May 1 - June 1	Late June 1 - July 10
Hybrids			
White		Boule deNeige (Oudieu) Catawbiense Album (Waterer) County of York (Gable)	Snow Shimmer (Wister) Sparkling Jewel (Wister) Summer Jewel (Wister)
Pink	Bosutch (Gable) Christmas Cheer (Methven) Strawberry Swirl (Gable)	Mrs. E. C. Stirling (Waterer) Wheatley (Phipps) Gretchen (Nearing-Gable) Janet Blair (Leach) Caroline (Gable) Mrs. E. R. Coe (Dexter) Josephine Everitt (Dexter) Mrs. Furnival (Waterer) David Gable (Gable) Gomer Waterer (Waterer)	June Achievement (Wister) Robert Allison (Gable) Cadis (Gable) Lady of June (Dexter) Midsummer (Waterer)
Red		Acclaim (Dexter) Mme. DeBruin (Koster) Princess Elizabeth (Waterer) Gigi (Dexter) Novazembla (Koster) Dorothy Russell (Dexter) Todmorden (Dexter) Vulcan (Waterer)	Fairmount Lodge (Wister) Ann Hardgrove (Hardgrove)
Blue-Purple		A. Bedford (Lowinsky) Ben Moseley (Dexter) Blue Peter (Waterer) Van Nes Sensation (Van Nes)	
Yellow		Mary Belle (Gable) Goldfort (Slocock) Goldsworth Yellow (Slocock) Prelude (Rothschild) Skyglow (Dexter) Unique (Slocock)	

Climbing roses once masked the front of the house where wood frames are bolted to the wall.



photos by author

WYCK: historic home of gardeners

by Léonie Bell

For years, the long street frontage of "Wyck" was my turf. I had to pass it each time I walked to my grandmother's house at the lower end of Germantown Avenue, and every time I saw that mysterious tall gray fence, with only roof eaves and towering chimney visible, I grew "curiouser." From the height of the Route 23 trolley, one might glimpse a glorious jumble of plants. Once in a while the narrow front gate was left ajar so passersby might see the big white house that seemed to stretch back without end.

Everyone knew that Wyck was privately owned so we didn't fret that we could not see it. But as happens so often in life, when one has a very strong desire to see something, eventually that wish is granted—in unexpected ways. When I finally entered the gate, it was by invitation.

By 1972, the ninth and last generation of the Haines family realized the place was more than they could care for alone. When the aging Mrs. Robert Haines decided to give her home to the Germantown Historical Society, she assured the preservation of the buildings. But what was to be done about

continued

Léonie Bell is Rose Consultant for Wyck and for the National Park Rose Garden here in Philadelphia. She and a small crew of enthusiasts have been searching for the old roses as they persist in the United States, for many years, to identify and restore them to the gardens where their age indicates they belong.

WYCK:



Rear of house as seen over the roses

the ground—all two and a half acres—and the formal garden? I was asked to advise about the roses. What treasure grew in that secret garden?

The first time I walked through the south pair of great glass doors, to look through a matching pair across the hall to the sunlit garden beyond, I was Alice in Wonderland encountering the bright garden at the end of the tunnel.

Ah, but what a terrible sight was the garden by then! The box around the formal beds had so spread and grown together over the paths, we had to wedge our way through. There were roses but only those that had managed to keep one foot ahead of choking weeds. To one side, an ancient wisteria, probably one of the original plants named after a family member, overwhelmed some host tree and was already reaching out for another victim. Where were any of us to begin?

Within a year, a group of concerned people formed the Friends of Wyck. A tree surgeon was brought in to save the trees; young people under the supervision of the one person who, above all, deserves credit for the gradual restoration, Anne Newlin Thompson, tackled the awful snarl of the garden; chemicals halted the worst of the weedy undergrowth. As order was tediously restored, other roses revealed themselves, much to our delight, for of all the plants that grew there, the roses were best loved. We know, because many letters survive that were written by this extended family that were truly Friends, who when they missed someone far from home would remind him which flowers and perfumes then graced the garden.

back to William Penn

To appreciate the history that rises like ancient myrhh from this hidden, self-contained, old family home, isolated from the street life of Germantown yet at its very heart—geographically, historically, emotionally—we must go back for a moment to the days of William Penn.

A year after he established Phila-

delphia in 1682, Penn extended a warrant for 5700 acres to a group of Hollanders from Crefeld. One of them, Hans Milan, drew Lot No. 17, a 20-acre tract that extended from The Great Road, or Germantown Avenue, all the way west to Wissahickon Creek which is now Fairmount Park. By 1690 he had built the first of a pair of houses; soon after 1700 he began the second for his daughter Margaret, who married another emigrant from Holland, Dirck Jansen. Space was left between the two stone structures to allow carts to pass between.

Many have thought that "Wyck" means white because the Dutch Colonial house, plaster on stone, was always coated with whitewash. Instead, the name is Saxon for a termination, a village or a mansion, a place where one's journey ended. And indeed, the hospitable families of Wyck were known for their open arms and simple but generous table.

These families were brought together in 1760 by the wedding of Margaret Wistar and Reuben Haines "the Elder." The cartway was enclosed soon after this marriage, for, when the Battle of Germantown was fought in 1777, the broad space was opened to the wounded and bore the stains of a field hospital for many years.

Their grandson Reuben Haines "the Younger" and his wife Jane Bowne are the couple who interest us most because they brought Wyck to its present splendor. Jane grew up in Flushing, Long Island, an area of great horticultural excitement, thanks to the importation of exotic plants and roses by William Prince and his sons. She and her husband, an active amateur botanist, were to set their mark on the grounds of Wyck for the next several generations.

Married in 1812, at first they lived in Philadelphia, using the doubled house of Wyck only in summer. There, the spell of the gardens, the clean air of the little town, and the proximity of many people with similar interests in all phases of natural history, convinced them to move permanently to Wyck a decade later.

Jane began immediately to lay out a formal garden along the north side of the house, where an arbor for grapes combined with natural shadow to cool the big rooms while, beyond, the patterned beds lay in full sun. She kept a small notebook of the garden's progress, with lists of plants already there as well as others to acquire. The dated pages record her activities from 1821 through 1829. It is from this frail book that we learned which roses grew at Wyck 145 years ago.* A few of these remain; others were added over the years. In time, we hope to restore as much of Jane Bowne Haines' rose treasure as we can find.

The drafty old cartway was permanently enclosed by William Strickland in 1824. He designed an ingenious arrangement of glass-paned doors that slide into the thick walls in summer to let in air, yet provide the light of a conservatory in winter. It is through these doors that one first sees the brilliant garden ahead, its focal point a small oval bed of roses that flower from May through October. (One is 'Marquise Bocella,' another, 'Baronne Prevost,' both introductions of 1842. The Marquise has long been known to the family as "the crown rose" because of its pouf-centered form.)

Reuben Haines' interests were so numerous, his friendships so enduring

continued

*See 1975 American Rose Annual.

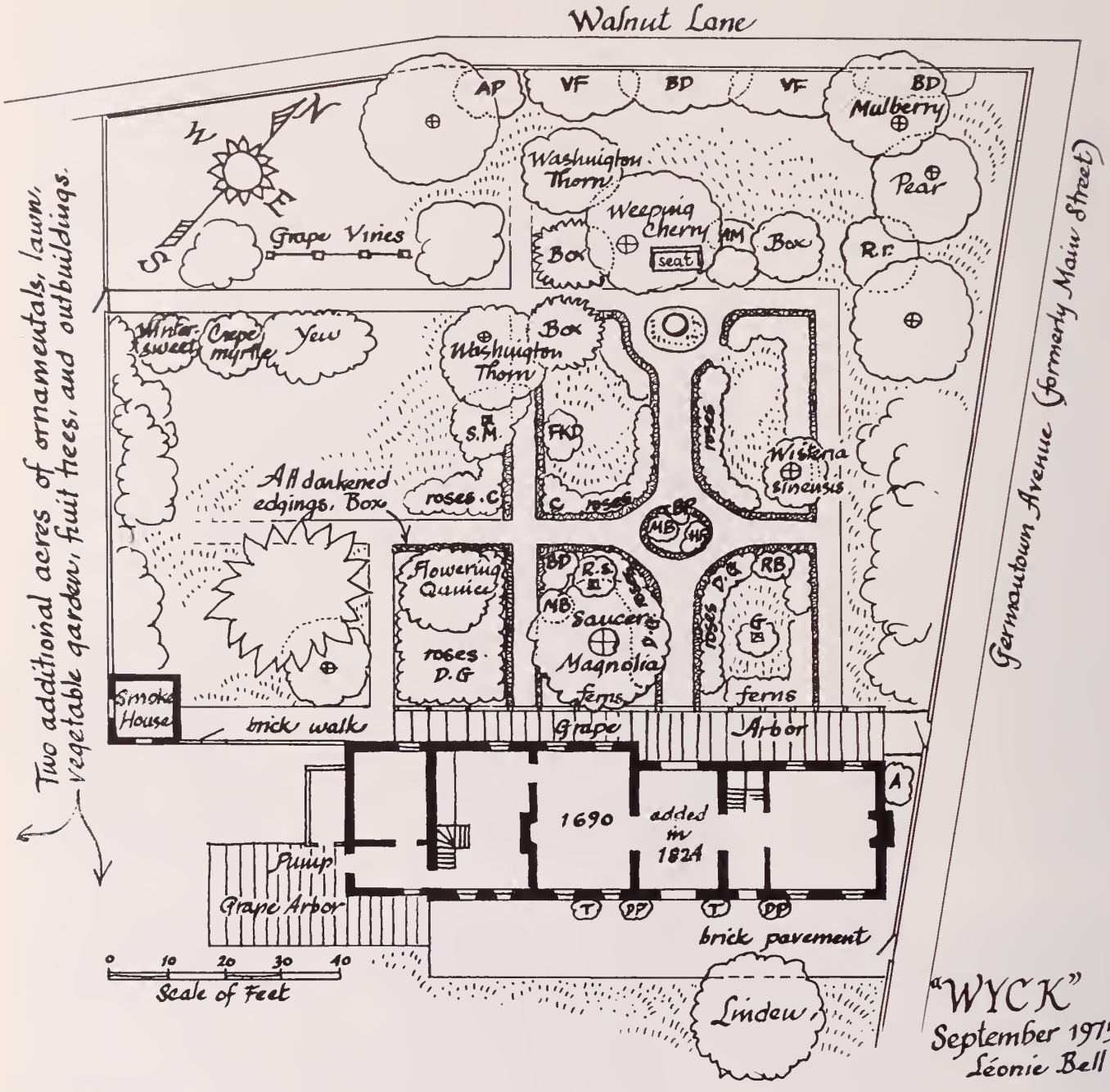


Looking through front doors to garden



'Celsiana,' a Damask hybrid that is rampant at Wyck and dates from at least 1700.

WYCK: continued



"WYCK"
September 1975
Léonie Bell

Roses growing at Wyck since 1910 —

A. Aglaia (syn. "Yellow Rambler")
AM. Alba Maxima
AP. American Pillar
BD. Bella Donna (syn. "Kazanlik")
BP. Baronne Prévost
C. Celsiana (syn. "Imperial Blush")
D.G. Damask, Gallica hybrids, mixed, unidentified (syn. Hybrid Provence)
DP. Dorothy Perkins
FKD. Frau Karl Druschki
G. Gardenia
HP. Hybrid Perpetuals, unidentified
MB. Marquis Boccella (syn. "Jacques Cartier")
RB. Rivers' Bernard (syn. "Rose de Reseht")
R.r. Rosa rugosa
R.s. Rosa setigera
SM. Silver Moon
T. Tausendchön
VF. Dr. Van Fleet

and varied, that he has been called with justification a renaissance man. He was first secretary of the Philadelphia Academy of Sciences, an early and active member of the Franklin Institute and the American Philosophical Society. His voluminous correspondence includes long exchanges with the Peales, John James Audubon, Thomas Jefferson, and scientists from all over the world. When General Lafayette returned to the United States in 1825 to show his son scenes of the battle in which he partook, Wyck was one of the homes where they stayed.

In addition, Haines received requests by the hundreds on every aspect of land and animal husbandry and exchanged seeds, roots, and cuttings freely. His adored wife Jane was not only sympathetic to all this, she partook in it herself and kept Reuben informed with numerous letters when he had to travel.

an abrupt end

Their idyll came to an abrupt end. From vibrant health Reuben passed to death overnight, in his own bed, at 45. Jane was left with five children and another on the way; this last baby was named Jane Reuben Haines ("Aunt Wyck") and the house was to pass to her for her 79 years of life.

Following Reuben's death, "Wyck was truly 'a woman's world'—a refuge during those years in which the Haines sons and nephews had not yet grown to fresh maturity."** They all kept in close touch, the habit of letter-writing by now a weekly necessity.

One of the menage, Cousin Ann, told about the garden. "Our oleanders look splendidly. The garden has quite revived since the late showers. The lawn is perfectly enchanting after sundown and early in the morning... The pomegranates are even more beautiful than the oleanders, their colour is so vivid." She was distressed that there was no one at home to enjoy "the exquisite perfume of the grape vine."

Another relative reports, "The weather has been so warm we could sit in the hall and even out of doors . . . I am often amused when sitting under the Linden—hidden by the embowering foliage of its pendant branches which already sweep the ground—to hear the exclamations of how sweet! how fresh! how beautiful! . . . The honey suckle is in full bloom—and the Champnez *[sic]* roses just opening and all contrast so beautifully with the pure white of the walls that I do not wonder they attract so much attention." The writer was referring to 'Champney's Pink Cluster' and offers firsthand evidence that none of the near-white Noisettes we find are this venerable American hybrid, *circa* 1815.

Out of the same period emerged another Jane Bowne Haines who never married but devoted her energies to making the garden a showplace again. The roses introduced around the turn of the century were added by her. Then, in 1907, she was inspired to open a school of horticulture for women only, similar to ones she had seen in England. With the help of Bryn Mawr friends, this dream became a reality by 1910 (originally known as The Pennsylvania School of Horticulture for Woman, it is now known as The Ambler Campus of Temple University). For many years it was the only such school for women in the United States.

Not long ago, when an old friend was invited back for a birthday celebration, he wrote afterward, "Philadelphia in June! How I love those Pennsylvania roses—and the roses around the door and in the garden at Wyck never looked lovelier." Since the garden has been reclaimed and the house repaired, the Friends of Wyck have set up an Open House in late May or early June when the roses are at their peak. Relatives and old friends are astonished by the order that once again prevails and are overwhelmed by the health, the prodigality, and the scent of the old roses. Many other plants of historic interest grow on the grounds, like *Morus alba,* the white mulberry, from which silkworms were hoped to provide a much-needed cottage industry; *Magnolia soulangeana,* surely one of the oldest specimens in the country; an enormous grove of *Pseudosasa japonica,* one of the hardiest and least invasive of the oriental bamboos. Primarily, though, this has been the home of generations of gardeners—and their roses.

●



Rose 'Bella Donna,' one of the roses on the list drawn up by Jane Bowne Haines in 1829.



Rear of house under grape arbor

**Wyck: The Story of An Historic House 1690-1970,* W. Edmunds Claussen (privately printed).



photos by Edmund B Gilchrist, Jr

LEAF PRINTS: scientific tool or art form?

The State of Science in Colonial Philadelphia

While chemistry got its start from people seeking wealth, botany got its start from people who wanted to stay or become healthy. The alchemists sought ways to turn base metals into gold, but the physicians searched for new cures for disease or in some cases new diseases for old cures! Most of the cures used were herbal (Ponce de Leon and the Fountain of Youth notwithstanding). That fact gave a boost to the development of botany in the new world during colonial times. The colonists were surrounded by plants unknown in England or Europe, plants used by the Indians for medicinal purposes. King James, better known as the patron of the King James Version of the Bible, wrote a tract entitled "A Counter Blast Against Tobacco" in which he mentions that the "heathen Indians" use tobacco to cure "ye poxie." The colonists learned of the Indian use of herbs and the physicians of Europe and England were anxious to find new plants to add to their dispensaries. Others who were collectors were anxious to have exotic plants in their gardens. Here was a market and a source but no communication between them. A merchant in London, Peter Collinson had customers urging him to find plants or seeds for them. He wrote to a merchant in Philadelphia who put him in touch with John Bartram. The man who is the footnote in this story is Joseph Breintnall, merchant in Philadelphia, friend of Franklin, secretary of the Library Company of Philadelphia, poet, scientific experimenter, but primarily remembered, if at all, as the go-between who introduced Bartram to Collinson.

You may have seen pictures in elementary science books of pieces of black cloth and white cloth on snow showing the snow under the black cloth melting faster. That does not seem like a terribly sophisticated experiment, but Breintnall, the first to perform and report it, did so at a time when science was less sophisticated than now. He also submitted for publication an ingenious semi-quantitative method for determining the relative intensities of solar radiation in summer and winter.

We must remember that Breintnall lived a full quarter of a century before Priestly in England would discover oxygen, or Volta in Italy would invent the electric battery. Breintnall was making his prints at the time (1740's) Linnaeus developed a system of naming plants in Latin. Breintnall used common names not because he was ignorant, but because the science of naming plants was just then being developed by Linnaeus in Europe and information traveled very slowly in those days.

Another thing to remember about science in the colonial period is that it did not break down into numerous subspecialties as it does now. A person who studied "science" studied *all* the sciences. Franklin and Jefferson, and others like them, were much closer to the renaissance, and although Breintnall may not have been in the same class as Franklin, he did live at a time when it was not unusual that a merchant should be a science experimenter and a man of letters. His leaf prints filled a need for accurate representation of plants for scientific study that existed at that time. Automatic instant cameras fill that need today. The beauty of Breintnall's prints is such that they are worth studying for that reason alone.

by David Boorse

David Boorse, who served as director of the PHS Summer Garden Workshop for children for eight years, frequently tried out handcraft projects at home on his own children first. Do his children do leaf prints?

"Well," he writes, " we do have paper, and newspapers for on the floor, and five acres of leaves, and ink. I have a big tube of really black, really gooey printer's ink. I guess the only thing Gwen and I lack for the children to do leaf prints is courage."

Photos at left and below:
"Beauty is its own excuse for being."

The Art Form

With the bicentennial upon us, it is natural that a science teacher and would-be gardener should be interested in what happened in science, especially botany "back then." I expected to read about John and William Bartram. What was not expected was the series of footnotes that led from one thing to another. One passage telling of a Philadelphia merchant who put Bartram in contact with Peter Collinson in London dead-ended with a tantalizing footnote: *J. Breintnall.* That was all.

Who was J. Breintnall? What did he do? No answers. When I came across the name of the Library Company of Philadelphia on a list, the question came to mind: "Would they have anything on botany during the colonial period?" A telephoned inquiry to the Library Company was answered by Mrs. Tonkin who replied, "Yes, indeed!" Among other things, they had Breintnall's leaf print collection in their archives. A trip to the library was rewarded by an answer to "Who was Breintnall?" as well as a chance to examine leaf prints made by him, here in Philadelphia, more than two and a quarter centuries ago.

The Breintnall leaf print collection consists of over 230 sheets of paper with prints of leaves. These were made by coating the leaves with printer's ink, placing them on a sheet of paper, folding the paper over and placing in a press or using a roller to make the print. Joseph Breintnall made these using leaves from his own garden, from gardens of friends, many of whom are mentioned in notes on the pages, or from leaves brought to him by travelers such as Bartram. Upon his death in the spring of 1746, Breintnall's widow gave his papers including the leaf prints to the Library Company of Philadelphia which later had them bound into two leather covered volumes.

It was difficult to choose from more than 230 pages the few that are reproduced here. Each print is unique. The pages are all different sizes and even the two volumes are not the same size. The papers on which the prints are made are highly varied but always handmade paper with interesting textures. The ink is a warm black or charcoal brown that shows up well against the creamy shades of the paper. These characteristics cannot be shown in a glossy reproduction. The prints chosen here do show, however, the delicate tracery of the leaf veins as well as the sometimes precise, sometimes poetic manner in which Breintnall arranges the leaves in his prints. The care and skill in making the prints is evident in the clarity of detail.

Breintnall's notes on the back of the pages add interest to one wondering about colonial times. Many names are mentioned in his notes: Ester Bank, Morten Garrett, John Holland, John Bartram, and Capt. Atwood. All contributed leaves from their gardens. One print has a sketch on the back and one might wonder if Ben Franklin, while visiting, had a sudden idea for a new stove or a musical instrument he was about to invent. Another print has doodling on the back, apparently by Charles Brockden, Deputy Mayor of Claims for the Provence of Pennsylvania. A number of prints are of vegetables,

continued





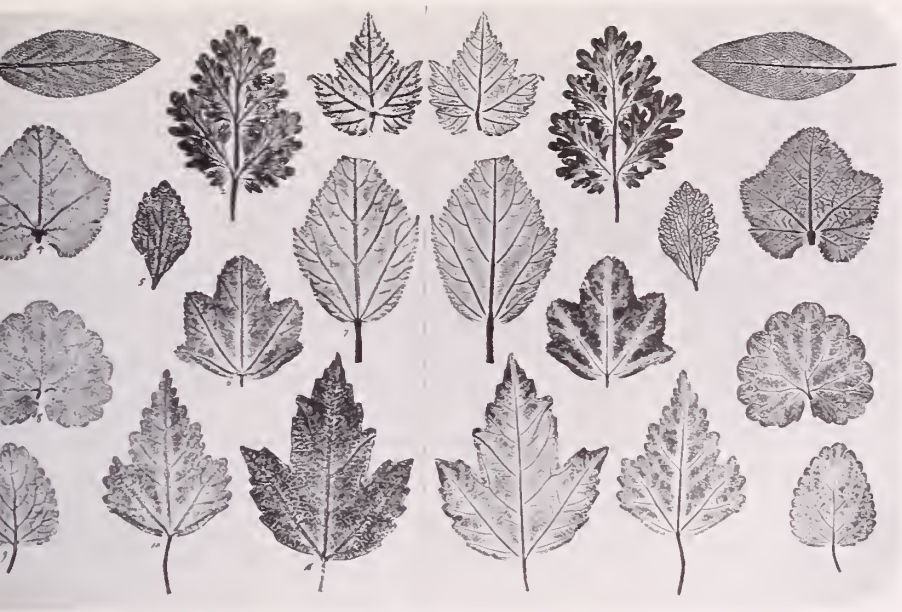
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2



3





1. One of the few prints using material other than leaves, this uses a feather to form an arch in an almost Romanesque design. Notice the leaf at the top along the crease in the paper, which would have been printed separately from the rest of the print. This is the print that inspired a botanist to pencil a poem on the back of the page in 1855.

2. *Lysimachia grandifolia* does not faze a 20th century, gardening-oriented mind, but it is interesting on a print that was made before Linnaeus' binomial nomenclature system was widely used. Actually the identification is written in pencil rather than in the ink that Breintnall used and is in another hand—probably that of either C. Price or W.E.W. Jr. both of whom made some penciled notes in the Breintnall prints during the 1850's. The note at lower right identifies the leaf as coming from John Bartram. The annotations on three of the specimens identify them as medicinal plants and serve to remind us that at this point in history most remedies were of botanical origin. The memo at far left, "The other side I sent to Peter Collinson June 1735," shows Breintnall's attention to detail, a good trait in both a scientist and a successful merchant.

3. Philadelphia had hemp in colonial times and Breintnall made several prints of it but left no memos regarding its use in those times.

4. Characteristic of many of the leaf prints, this page shows where the sheet was creased in the middle, and how the inked leaves were placed on the sheet to conserve space. The folded sheet was then placed in a printing press. The results—the sometimes bold lines, sometimes beautifully delicate traceries—easily rival many of our modern graphics techniques.

5. The presence of the leaf of a pineapple in Philadelphia in the 1740's makes us wonder whether it was from one of the British sugar plantations in the Caribbean, which regularly shipped sugar and rum to the colonies, or if some Philadelphian with a greenhouse was trying to grow his own pineapples. The locust leaf (see arrow) shows a mutant leaflet with a double center vein filling the space where two leaflets would normally have occurred.

continued



Breintnall, frequently experimenting with various techniques, made notes on the sheets as to his methods. Here he was obviously after the aesthetic affect rather than a print for scientific study, and his notes apparently describe how he manged this affect, though, unfortunately, this is one of the few cases where his captions are not quite clear. Other techniques which he describes using are a roller, a news press made for him by Joseph Watkins in 1734, and the use of a velvet ball for printing.

many are of medicinal plants and others are plants collected from the wild.

On one print is the comment ". . . grape is from C.B.'s which he takes to be wild, I not." Another print is labeled "wild grape" but also bears the penciled correction: "blood root." It is not unusual for a botanist when looking through herbarium specimens to identify a plant or to correct a misidentification. When this is done the person making the correction or addition usually signs or initials and dates his entry on the sheet. Apparently at least two people did this to Breintnall's prints in the 1850's. "C. Price" and the year "1855" occur on several sheets with corrections or with scientific names added. The initials "W.E.W. Jr. 1859" occur in pencil on several sheets also.

It is unusual, however, for persons to pencil poetry on herbarium specimens so the following poem on the back of Plate No. 6 was most unexpected:

If you a Botanist would be
Roam over hill and Dale
Inspect each flower, each plant and tree
That grows within the vale.
Climb crags, rocks and Mountains high
Scan every shady nook
Serch [sic] *caves and caverns wet or dry*
Lake river fen or brook
Traverse the desert and the field
The forest and the dell
For nature there does treasure yield
That art cannot excell.
There flows with all their various hues
To [sic] *lovely to behold*
There fragrant odors will diffuse
There treasures will unfold.
In midday sun in evening shade
Your task do not neglect
For all that nature's hand hath made
Is worthy of respect
God's science Book with open page
Through all creation cries
To all mankind from age to age
Peruse me and be wise

A Botanist, May 1855
W.E.W. Jr 1859

Breintnall Sets History Straight

While it has been written that Benjamin Franklin sent the first rhubarb seeds to the colonies from abroad in 1770, researcher Susan Milius found when checking information for the PHS Bicentennial Rare Books Exhibit that Breintnall's rhubarb leaf prints preceded Franklin's transaction by 32 years; his prints were dated 1738.

Editor

Perhaps on looking at the print that inspired the poem and then comparing it with others such as plates 4, 8, 10, 13, it is evident that Breintnall is more concerned here with aesthetics than with scientific recording. The use of the feather to make an arch and the spacing of the leaves—all of which are common plants occurring elsewhere in the collection—give a poetic feeling to this print. (For some reason it reminds me of a Dali.)

On one print of rather coarse oak leaves (probably chestnut oak) is the inscription: "Done 26th June 1735 brot from North Wales two days ago and lok'd for myself." My thoughts went back to my childhood in North Wales. My father used to take me out to the edge of town to Johnson's farm where our family had a small garden. Is it possible that Breintnall had collected leaves from the oaks in *that* meadow where I used to gather acorns? Might he have sat by the huge fireplace in the Johnson home back when it was an inn where William Penn and other early 18th century travelers stopped? The same fireplace we used to gather around two centuries later to sing carols for the Johnsons each Christmas Eve? It hardly matters—just one of those interesting reveries that some of us experience after too long in a library. But for a moment there was never an Alvin Toffler, nor a *Future Shock,* nor even traffic on Walnut Street outside the Library Company. Thank you, Joseph Breintnall. Your prints make some aspects of the colonial period much more real to us. Your name really deserves to be better known.

●



veronica:

a beautiful weed or a blue-eyed nuisance?

by Joseph W. Adams

In 1940 Robert L. Schaeffer, Jr., a botanist collecting herbarium specimens for his doctoral thesis, found an unfamiliar veronica growing as a weed near Martins Creek in Northampton County, Pennsylvania. It was identified as *Veronica filiformis.* A search in botanical works revealed that he was the first to collect the species in Pennsylvania. As time went by it was seen spreading into nearby counties and shortly before 1946, the weed was found on several lawns in and around Philadelphia.

Veronica filiformis, also called Caucasian Speedwell, is a member of the large figwort family, *Scrophulariaceae,* which also includes such familiar plants as digitalis, pentstemon, and butter-and-eggs.

An English authority states it is native to Asia Minor and the Caucasus. It was introduced into English gardens in the early 19th century. Strangely enough, it was not grown widely in rock gardens until about 100 years later. While a beautiful rock garden subject, its tendency to spread rapidly and choke out its more delicate and non-aggressive neighbors outbalanced its beauty and it lost popularity. The same authority reports that after being tossed onto rubbish dumps it started establishing itself over much of Britain and Ireland, successfully competing with lawn grasses. On the Continent it became a serious problem in Germany, France, Austria and Switzerland. Yet, in its native Caucasus it lives as a normal, well-behaved species—not a weed; another example of a member of a balanced biome becoming wild when removed to a favorable strange location.

Its species name *filiformis* is suggested by the thread-like creeping leafy stems that intertwine to form dense patches one to 4 in. thick. Small at first, these patches increase rapidly in size and by joining with others close by in time they cover the lawn.

When in flower from mid-April until late May and even early June it is a sight to behold. The ground appears to be covered with a pale blue unseasonable snow. To a real flower lover it is almost painful to walk through the solid bloom, but a glance backwards shows no footprints on the flowers.

. . . after being tossed onto rubbish dumps it started establishing itself over much of Britain and Ireland, successfully competing with lawn grasses.

Each stepped-upon spot springs back with no apparent harm.

A close to the ground inspection reveals perfect individual beauty. Each flower rises atop a hair-like pedicel vying with its neighbors in showing off its loveliness. The corolla about half an inch in diameter is of four delicate blue petals, three of which are deeper blue with even deeper blue stripes radiating from the white eye in the center. The eye has a light green spot from which emerge two stamens tipped with

continued



Close-up of *Veronica filiformis.*

photos by Barbara H Emerson

dark anthers. Between these two stamens rises a single pistil with a yellowish stigma. Below all these is the fourth petal of whitish blue with suggestion of stripes radiating much like those of the other three petals.

A person studying a single flower and then looking around and seeing the countless similar flowers might naturally think of the millions of seeds formed by all these flowers.

The jolt comes when you learn that each and every flower is sterile and that never has there been found in Britain or this country, a single plant that produced seed! This perennial was introduced and spread by artificial means—as entire plants or living pieces. Being so beautiful it unquestionably was brought into each country by plant lovers or botanical institutions. Once inside, it spread to new localities by gifts or exchanges among gardeners.

We now know that Caucasian Speedwell is a real "baddie," a fast spreading weed in lawns. Fast spreading without seeds? Yes, and easily done.

Since it roots readily at the nodes along the stem small pieces cling to lawn mowers, and on dewy mornings to shoes, and are carried to new areas of the lawn during favorable weather.

At the Morris Arboretum its spread has been phenomenal. Started as several small planted patches some years ago it has increased to the point where today the lawns on the Philadelphia side are covered by this beautiful weed.

The jolt comes when you learn that each and every flower is sterile and that never has there been found in Britain or this country, a single plant that produced seed!

During the blooming period visitors have been seen secretly snitching a handful or two and wrapping it in facial tissues and carefully putting it in handbags, probably for home-growing, little realizing that they might regret breaking the 7th Commandment.

Actually during the annual Spring Flower Plant Sale at the Morris Arboretum people asked to have the plant potted to buy for their lawns.

Caucasian Speedwell is a merciless "choker." Lawn grass, small weeds—almost everything succumbs to its invasion. In the end only a few upright blades of grass can be seen hopelessly holding out for a while above the solid creep of this weed.

During the entire year, even in winter, with countless people walking on these carpets, there are no holes "worn" in them. A perfectly hardy evergreen, nothing, not cold, snow, nor even ice will discolor the pleasing green of the myriads of rounded leaves, shallowly scalloped and about half an inch in diameter. It makes a nice winter lawn.

Although *Veronica filiformis* has responded to a few herbicides, none have consistently produced satisfactory control. For weed control recommendations, check with your County Agricultural Agent (see page 12 of the *Philadelphia Area Green Pages* for a list

and telephone numbers).

Those who dislike it can be thankful that strains bearing viable seed, of which there must be many in its native range, have not gotten into this area, or its spread would be much worse.

Villain, though it is, its aggressiveness can be potentially valuable to the owners of city or suburban homes with yards, especially those with sloping banks, difficult to mow. Many aged people enjoy taking care of their small lawns but without straining their hearts pushing or guiding a lawn mower. After all, it does form a solid turf that keeps beautiful by weeding itself through its habit of choking competition. Also, since it grows to no more than 3 or 4 in. thick, mowing becomes unnecessary. Kept under control it could be a blessing for many people.

To summarize: Caucasian Speedwell is an attractive evergreen perennial in this area and beautiful during its long flowering period, both close up and en masse. Its beauty is behind its increasing distribution by plant lovers. Once established in a lawn its spread is almost impossible to check and it becomes a serious weed. Since there are no effective controls, as yet, serious consideration must be given before introducing it into a clean lawn. Caretakers of golf courses or estates with beautiful grass lawns must be especially vigilant and destroy any introduced plant.

Those who have not seen this remarkable plant should visit the Morris Arboretum in Philadelphia any time of the year to make its acquaintance. If a special visit is made between mid-April and June 10th when the lawns are covered with millions of blossoms the visitor will get an unforgettable treat. Remember, however, it is a weed here!

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about Joe Adams . . .

"On October 5th, 1932, I started my 'temporary' job in the Arboretum by collecting my first herbarium specimen—*Viburnum betulifolium*. My 'temporary' job has been continuous for 44 years: first as plant collector and records keeper, then as assistant in taxonomy and later as curator of the Herbarium. In 1951 I left the Morris Arboretum to work at Philco for 20 years. During the memorable going-away-party on the old Mansion porch, Dr. J. R. Schramm, the then-Director, gave me the official title of Honorary Curator of Aquatics because of my life-long interest in water plants. This title I lovingly, but secretly, kept through three Directorships of the Arboretum, including the present one. Now, since December 1973, I am back as a part-time active member of the staff. I have new and younger colleagues and volunteers whom I enjoy knowing and working with. Out on the grounds I'm making other new friends. Some wave in the breeze, others flit from place to place singing or chirping while other little rascals scamper about the grass or climb up trees, scolding me. I truly enjoy being here again."



So plentiful are the flowers of the blue-white veronicas between mid-April and early June that they appear to be an unseasonable blue snow.

THE BEST NATURAL BOTANIST IN THE WORLD

John Bartram (1699-1777)



photos by Edmund B. Gilchrist, Jr.

by L. Wilbur Zimmerman

L. Wilbur Zimmerman is vice-chairperson of the PHS Council. He has had a long-time interest in the life and works of John Bartram.

Bartram's Gardens

John Bartram was among the earliest of Americans to achieve fame and international recognition. A provincial Pennsylvania Quaker, he attained the equivalent of a third-grade education, which was all that was available in the schools of the new colony. Yet as an adult, with some help, he learned to read Latin in order to study botanical textbooks. He rose from relatively modest origins to become known to some of the world's foremost thinkers of his time.

Bartram corresponded with European scientists including the botanists Linneaus and Gronovius, and his letters to Peter Collinson were read before the Royal Society in London. The Royal Academy of Sciences at Stockholm made him an honorary member and later in life he held the post of Botanist to the King of England for the American Colonies.

John Bartram was listed as Botanist to the King in the first *Transaction of the American Philosophical Society,* published in 1771. The APS was established in Philadelphia to promote useful knowledge of all kinds, including horticulture, for the colonists. It was established by Bartram's good friend, Benjamin Franklin, who was elected as its first president in 1771.

Other colonists, experts in natural history and plants, such as James Logan of Germantown, Dr. Garden of Charleston, Dr. Colden of New York and Dr. Clayton of Virginia also looked upon John Bartram with great esteem and were pleased to correspond as well as visit with him.

Famous travelers, European and American, who came to Philadelphia sought out John Bartram at his Kingsessing farm on the Schuylkill.

For all his apparent simplicity and Quaker directness, he was a complex individual, an avid and thoughtful student, a practical and highly successful farmer, who had a deeply religious sense yet was far from orthodox in his thinking.

The Darby Quaker Meeting, of which he was a member, "read him out of meeting" in 1757 at age 58 because he did not believe in religious miracles, notably the virgin birth of Christ. Bartram cut in stone above his greenhouse door a quotation from Alexander Pope:

Slave to no sect, who takes no private road, but looks through Nature up to Nature's God.



photo by Robert Rich

John Bartram's son, William, has written that his father "never had a likeness made." However, this portrait hangs at the Pennsylvania Horticultural Society and is labeled "John Bartram (1699-1777) by Charles Willson Peal 1741-1827." It has not been authenticated.

BARTRAM'S GARDENS
54th Street & Elmwood Avenue
Philadelphia, PA 19143

The house that John Bartram built and the land on which he grew rare plants and trees is today a public park owned by the City of Philadelphia. The city park, known as Bartram's Garden, is supervised by the Fairmount Park Commission, which works closely with the John Bartram Association. The park is always open. Fortunately, the house is much as it was in John Bartram's day. Charmingly furnished in keeping with its period, it is open to the public daily from April through October. The grounds have been replanted with such shrubs and trees as John Bartram brought there. Many trees are large and old but none date back to Bartram's time.

Many of today's visitors speak of the strong impression they gain of the man who built the house and planted the garden.

Archeological, historical and horticultural research is carried on by the John Bartram Association as funds permit. "A Common Flower Garden" in the original spot is being planted and will be maintained by the Garden Club Federation of Pennsylvania.

For information about membership in the John Bartram Association contact Carol Lynch, executive secretary, at Bartram's Garden.

Medicine and surgery were John Bartram's earliest interest until he inherited a farm from his uncle in 1728, close to where he was later to build his house and develop his famous garden.

The traveler, de Crevecouer, and others report that John Bartram's interest in botany began when by chance he closely examined a daisy in the field while resting from plowing. But it is just as likely that his knowledge of medicinal herbs, his innate accuracy of observation and inherent curiosity about plants and nature, predisposed him to follow so earnestly an avocation that led Linneaus to describe him as "the best natural botanist in the world."

The building of his own handsome house by splitting rocks as much as 17 ft. in length, the studies in botany and his extensive plant collecting trips were all adjuncts to his chief task, that of running and improving his farm to provide for his family. Not the least of his contributions to his fellowman was his inventiveness in composting for fertilizing, of ditch drainage and promoting the concept of fallow fields.

Bartram became acquainted with Peter Collinson, a well-to-do Quaker cloth merchant of London, somewhat accidentally. Collinson was an eager plant collector and continually hectored some of his business connections in the Colonies like Joseph Breintnall of Philadelphia and his correspondent, Dr. Samuel Chew, to send him plants. They both finally conceived the idea of telling Collinson about Bartram and this was the start of a 38-year period in which a steady flow of seeds and cuttings were sent to England, and money, letters, books and advice returned to farmer John.

It was through Collinson that Bartram's contacts were greatly expanded, by making him known to other important naturalists and to gain him other well-to-do patrons. It was Collinson who ultimately obtained for Bartram the King's commission as Botanist to the Colonies and who financed his last and longest plant collecting trip to Florida when he was 66 years old.

continued

John Bartram (1699-1777)

We cannot divorce the consideration of John Bartram from that of his son William. The son, born in 1739 when John was 40, accompanied his father on many trips as he grew up. The most noteworthy was the long trip to the Virginias, Carolinas and Florida. It is in part, through William's natural history drawings sent to Dr. Fothergill and others, that we can give John Bartram his just recognition for the introduction of certain new species of plants.

It was, however, the ambiance provided by the father John's restless spirit of curiosity, by his books and the superior botanic garden that put William on the way to becoming the foremost naturalist of his time. He was also a gifted writer and artist who left a valuable legacy in his records of exploration.

It is interesting to consider some of the factors that were surely important in contributing to John Bartram's eminent position among plant explorers and botanists.

At this particular period in history, wealthy and scientific minded people in England and on the European Continent were taken up with the fashion of importing and growing exotic plants. Wherever the East India Tea Company's ships went, as well as its Dutch counterpart, a botanist was aboard in the person of either a cleric or a physician. These men were commissioned to obtain material from foreign plant collectors all over the world. So the time was ripe for the recognition and exploitation of the superior skills and energy of a plant collector like John Bartram.

One of the more important patrons of Bartram's was the distinguished Sir Hans Sloane, physician to George II, whose collection of books, natural objects and herbarium was the nucleus of what was later to become the British Museum.

Philip Miller, another recipient of many of John Bartram's shipments, was the author of *Gardeners Dictionary,* considered the greatest botanical work of its time. He was also the chief gardener of the Apothecary's Garden, the ancestor of Kew.

The famous John Fothergill, another London Quaker, who was later to acquire many of the fine drawings from son William, was also a staunch patron. But it was through the letters to the less famous Collinson that we know most of the details of John Bartram's exploring and collecting, as well as the descriptions of his own gardening activities.

Besides Bartram's long trip to Florida, he had been three times to the Catskill Mountain area, six different yearly trips to New Jersey, one to the upper part of New York State and to New England. He also traced the Schuylkill to its source. He went at other times to South Carolina, Western Pennsylvania, West Virginia and on several other trips to Virginia proper.

It is difficult to know how many plants were introduced into England and Europe as a result of Bartram's collecting. But by piecing together the introductions credited largely to Miller and Collinson it seems reasonable to estimate that Bartram was responsible for introducing somewhere between 150 and 200 species new to the old world.

It seems reasonable to estimate that Bartram was responsible for introducing somewhere between 150 and 250 species new to the old world.

It has been considered almost as important that he sent quantities of plants, and repeat shipments of earlier new species, thus accelerating the spread of the growing of American exotics.

To mention only a very few of the better known introductions, there were *Azalea nudiflora, kalmia, viburnum, Ilex verticillata, Spiraea tomentosa, Leucothoe racemosa, Pieris mariana,* tsuga, Star of Bethlehem, dogwood, *Rhododendron maximum.*

There were other aspects of John Bartram's accomplishments that demonstrate his innate intelligence. His garden was a true botanic garden in the sense that it contained native plants he had collected as well as those exotics he received from abroad and the growing of still other plants for which he had collected only seed.

His intellectual drive was responsible for what may have been some of the earliest hybridizing by working with the red campion.

He was undoubtedly familiar with and stimulated by James Logan's work with maize and his theories of plant sexuality. Bartram, however, seemed little concerned with receiving recognition for his experiments, for he kept few written records.

The influence of Bartram on European botany and horticulture was not limited to Great Britain. Such visitors as Michaux and Castiglione were much impressed, and carried both plant material and new knowledge back to France and Italy.

As part of the evaluation of John Bartram we need to think of the richness of opportunity presented by the large unexplored wilderness filled with useful and ornamental plants, that European collectors were avid to obtain. At the same time we fully appreciate the obstacles and dangers that John and, later, son William, had to face in accomplishing their wide ranging collecting trips.

It is interesting to note also that John Bartram expressed the belief that submerged mountains might be found in the deep seas, a theory that was not substantiated until many years later. He was convinced also that large areas of the Eastern seaboard had once been under water, which of course has since been confirmed by the opinion of modern geologists.

These things were in dead opposition to the current thinking of his time and yet how prescient his ideas were.

Another example of Bartram's quality of mind was his ready acceptance and adoption of the binomial nomenclature as proposed by Linneaus and others. In a short space such as this much remains unsaid, but enough is here to show that John Bartram, the self-educated man, as a farmer, as a botanist, and as an explorer proves himself to be the peer of Franklin and Logan and other natural scientists of his time.

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John Bartram's house



This cider mill at Bartram's Gardens is believed to have been made by John Bartram. A model of how the mill works may be seen in the house. The rock in the center is supposedly hewn from native rock by Bartram himself. The apples were placed in the large trough in the inner circle. An axel was attached to a post in the center of the rock and was turned either by a person or an animal walking around the outer edge. A wheel moved around the middle of the trough crushing the apples. The juice ran down into a hole and was filtered through to another depression (approximately at 3 o'clock position in photo) where it was dipped up.



GENESIS OF A BOOK

by Hal Bruce

Hal Bruce teaches a course on horticultural and botanical writing among his roster of English classes at the University of Delaware. For five years, Bruce was garden taxonomist at Winterthur in Delaware and is taxonomical consultant there at the present time. In 1968 Viking published his book, *Winterthur in Bloom.*

The following excerpt has been taken from the first chapter of Hal Bruce's recently released book *How to Grow Wildflowers and Wild Shrubs and Trees in Your Own Garden.* *

In 1967 I began teaching at a branch campus of the University of Delaware in Georgetown, a pretty colonial town in the heart of Delaware's southernmost county. The people of Georgetown were friendly, the job was enjoyable, my students were anxious to learn. The only hitch was that George-

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Hal Bruce, the author, en route to a book.

town is a long way from home for me: it is about ninety miles south of my home near Wilmington, or 125 miles south of Philadelphia—almost on the same latitude as Washington, D.C.

Not a week passed in which I did not travel at least five hundred miles by automobile. These trips, through autumn and the long grim winter, through a beautiful spring and into a marvelous summer, became the genesis of [a] book.

For the first time in my life I found myself exposed repeatedly to a large segment of the American landscape. I found myself seeing more each time I looked, noticing more than I had ever had time or opportunity to notice.

After a time a strange visual effect began to take place. I became familiar with certain landmarks—a particularly distinguished house, a well-planned garden, a picturesque patch of swamp or woodland, a pond or stream, even a well-shaped tree or a brightly blooming shrub. These I began to look for, anticipate half-consciously, as I sped down highways, noting, again only half-consciously, seasonal changes and seeing the landmarks each time in a different aspect or dimension. My comprehension of the landscape grew with each passing week as I learned to see time and change as well as color and line in the countryside. I finally began to perceive the delicate balance between the permanent and the ephemeral from which much—perhaps all—of the beauty in art and nature arises.

My mind of course applied this somewhat rarified philosophy long before it formulated it. For example, I swiftly became aware that color is at once the most visually stimulating, the most appealing, and the most ephemeral attribute of plants. It is also the most wearying and cloying. Too often we choose garden plants for color only, and when their season of bloom is past, we have little remaining. Or we are seduced in early spring by bright pots of annuals at garden centers and overload our gardens with them. Form and mass and line are less obvious but paradoxically more important to the human sense of balance and design; they are also more permanent, more suitable as a framework in which to use color. A garden designed on the principals of form, line, and mass is much more satisfying than a garden crammed with eye-glutting geraniums or azaleas and little else.

I also learned much about succession of bloom on my trip. I saw for example that wave after wave of white sweeps through the woodlands of the East all through the spring, beginning with blossoms of Shad Bush in April and continuing at two-week intervals first with Flowering Dogwood, then with Chokeberry and Blackhaw Viburnum, and ending in June with Ironwood Viburnum and Elderberry. What I had recalled as one great, long burst of white flowers is really a series of overlapping shorter bursts, ebbing and flowing, varying greatly in species, in shade of white, even in details of individual blooms, but varying little in total effect. Several years ago, when I was a young horticulturist at Wintherthur, the magnificent garden of the late H. F. duPont, I learned that one of Mr. duPont's major concerns was that his garden provide what he called "succession of bloom." I was not impressed by the idea then. I know now that Henry F. duPont had been a close observer of nature during his eighty-odd years.

A garden designed on the principals of form, line, and mass is much more satisfying than a garden crammed with eye-glutting geraniums or azaleas and little else.

My journey began in late summer, a few weeks before the beginning of the school year, but I didn't begin really to *see* until there was little obvious to see—until winter had set in. When summer returned, I was a trained eye, and I saw more with each passing week than I'd ever seen before. For years I had, like everyone else, noticed the profusion of pink, white, mauve, purple, and yellow flowers that cover our fields and roadsides from August until almost frost (indeed, only a blind man could fail to notice them, so showy are they). I knew also that this profusion of blossoms was supplied by relatively few species: the Joe-pye Weeds *(Eupatorium purpureum, E. maculatum),* Boneset and Thoroughworts *(E. perfoliatum* and others), Ironweed *(Vernonia),* Swamp Milkweed *(Asclepias incarnata* and its variety *pulchra),* and Flat-topped Goldenrod *(Solidago graminifolia).* It had never struck me that there existed between these species, many of them completely unrelated, a similarity so striking that one could call it mimicry. The Swamp

continued

Milkweed, for example, resembles the Joe-pye Weed with which it grows in color, form of inflorescence, even in superficial aspects of stem and leaf, far more than it does its bright orange relative Butterflyweed which blooms about the same time in uplands. Flat-top Goldenrod is yellow, like most *Solidago*. It is therefore different in color from its growing companions, but it closely resembles them in its broad, flat compound inflorescences, totally different from the upright spikes and tiered thyrses one usually associates with goldenrods.

Nor is this sort of mimicry limited to the plants of the summer swales and fields. When I finally found the delicate little Whorled Milkweed *(Asclepias verticillata)* of the Serpentine Barrens along the Mason-Dixon Line, I realized that I must have been looking at it for a long time without seeing it, so effectively did its narrow leaves and off-white flowers mimic the yarrow and mountain-mint with which it grows. Again, my plant-hunting friend Dick Ryan and I searched diligently for several seasons before we found a spike of the magnificent Purple Fringeless Orchis, and immediately after finding that one we found a full stand of it; once we had observed the plant, we began to detect other individuals among the similarly colored Joe-pye and Ironweed with which they grew.

Obviously these cases of mimicry are environmental adaptations. The survival value in the case of the orchid apparent; the far more abundant and adaptable Joe-pye and ironweed serve as a sort of floral smokescreen for it. Perhaps the same applies in the case of the milkweed. It also may be, though I have not proved this to my satisfaction, that the similarities in coloration and form may be adaptations to specific pollinators. In other words, the August and September bees and butterflies frequenting the orchid meadow may prefer colors in the mauve-magenta range to any others.

Such is certainly the explanation for mimicry in the summer swale association, though my job in Georgetown had been over for a full year before the reasons became clear to me.

Early one September afternoon I drove west on New Jersey Route 70 through the Pine Barrens on my way to spend a final weekend by the sea at Barnegat. It was the composite season: tall goldenrods with turreted, towered, steepled inflorescences bloomed everywhere upland, in dry fields, along sun-splashed roadsides, even in clearings among the pines. Here also were the first lavender flowers on the tiny *Aster concolor,* the long purple wands of *Liatris graminifolia,* the yellow bells of Fern-leaf False-foxglove *(Gerardia pedicularia).* In roadside-swales the association of Swamp Milkweed, Joe-pye, Boneset, and Flat-top Goldenrod was at its height of bloom. The goldenrod was especially showy, with its great compound heads a foot across. Meadows, mounds, plains, plateaus of gold, rather than steeples, I thought to myself, as an immense butterfly, russet and black-spangled white, sailed majestically out of the sky to alight on one of the golden inflorescences.

I swiftly became aware that color is at once the most visually stimulating, the most appealing, and the most ephemeral attribute of plants. It is also the most wearying and cloying.

This was it, of course! The answers to the most esoteric questions are often so obvious that they are ignored. My great, broad, mounded flowers were the landing fields of butterflies, their natural pollinators. Bees, flies, and such can move between the closely packed tiers of flowers in an inflorescense of ordinary goldenrod, can crawl up and down the fragile wands of liatris, can maneuver over and under the spherical heads of Common Milkweed, but three-inch monarch, viceroy, fritillary, or swallowtail butterflies need room to negotiate. Thus *Solidago graminifolia* and its smaller relative *S. tenuifolia* have adapted themselves to pollination by the big butterflies which appear late in the summer, as apparently have the Swamp Milkweeds, Joe-pye Weed, and others which share their habitat. This is not to say of course that *only* butterflies pollinate these plants; they are perhaps not so specialized as to be adapted to a single pollinator. But by making themselves easily accessible to large insects as well as small, they have vastly increased their chances of being cross-pollinated and setting seed.

I found in this more than mere natural history. It was one more natural application of the rules governing gardening. First, the color combination was varied but pleasing, both the contrasts between the whites, yellows, and purple shades, and the more subtle gradations from off-white to pink-mauve to purple. Second, there was an excellent balance between order and disorder, between uniformity and variation, in that the form of the flowers, their height, and general shape were nearly identical, while their colors varied enormously. The aim of the landscape gardener is to banish chaos and yet retain pleasing variation, to bring order to a landscape and yet avoid monotony. One way to do this is to bring a series of variations on a certain constant. In this case the constant was shape of inflorescence—flower form—while the variable was flower color.

Another realization came to me with great force as I traveled north and south. I saw many attractive gardens, many beautiful cultivated plants. In particular I remember a gorgeous Golden-chain Tree dominating a dooryard in one small town, every inch of the tree, from its glossy trunk to its finely divided leaves, its upright branches, its hanging clusters of yellow blossoms, proclaiming it an aristocrat. In another town I watched a Chinese Redbud so flagrantly magenta that it made my eyes ache, yet blooming so early that so much color seemed right. Farther south I recall a row, almost a hedge, of Crepe-myrtles, all of different colors and all large enough to be noteworthy in our fairly harsh climate. In midsummer they were truly spectacular.

But these sights were only a few among the many which delighted me. More often, the great effects which I saw were natural, not man-made; almost without exception, the beautiful individual plants I saw were wild plants. I realized that nature was still the greatest gardener of all, and I thought about writing a book if only to tell of the sights I saw and record the thoughts which such sights brought to me. An example: in early April, when the cultivated landscape becomes blatant with forsythia, I watched closely a totally unique planting—a hillside so thickly grown with young maples that nothing save a few mountain-laurels grows beneath them. The absence of competing low growth, along with apparently abundant moisture and a northern exposure, has encouraged the growth of mosses on this hillside, so that the whole expanse is a carpet of green, yellow-green throughout the winter, gradually deepening with spring until it becomes that extremely vivid bronzy color known appropriately as "moss green." I remember watching that glowing hillside and thinking that, color for color, it was almost as bright as forsythia yellow, yet the latter color was gaudy in comparison. Because it was so overused? Probably. At any rate, the effect of the ground itself glowing a vivid green was totally novel to me. I do not think that this moss garden was planned. It just happened. But apparently the people who own it have enough sense to leave it alone.

I took a side trip in late May through the Pine Barrens of New Jersey. Mile after mile of soft green Pitch, Scrub, Yellow Pines lined the narrow roads. Dozens of colorful herbaceous plants bloomed along the sandy roadsides. And back beneath the pines as far as the eye could see bloomed pink and white Mountain-laurel, a gorgeous, undulating pink carpet beneath the trees. I had never seen so much color concentrated in a single combination of plants before, yet the effect was far from overpowering, mainly because of the contrasts between the frilly flowers and the green needles and dark, rugged trunks and branches of the pines. Suddenly I came on a tiny bungalow sitting in the middle of a perfect rectangle of pale green grass. It stopped my car. Not a single pine remained in that rectangle chopped out of the wilderness. And not a single Mountain-laurel. All that relieved the stark house and starker yard were two Norway Maples and two pink weigelas. Weigelas! They were in bloom, and so resembled the laurels on first sight that I had to look a second time to ascertain that the house owner had not spared two laurels for his dooryard. But they were weigelas from far China, similar in flower, perhaps, to the native Mountain-laurel, but inferior in habit, foliage, winter interest, in every other way.

I wondered what the man who built the place thought of as he cleared his land. He perhaps felt like Daniel Boone putting his mark, imposing his personality on the wilderness, and that's a good, traditional, time-honored American feeling. The problem is that it is as out of date as Daniel Boone's muzzle-loader. I also thought of the many discerning gardeners in this country and abroad who would have given eyeteeth to have in their gardens a stand of mature Mountain-laurel like that obviously cleared from this land. One thing was certain, the anonymous owner of that property was incomparably poorer for his attitude toward his environment. All around him the forest blossomed, while his house sat in an angular desert of his own making.

Such sights were common on my travels. The pattern was everywhere the same: perfect squares or rectangles hacked out of the forest; a few trees perhaps left for shade, but more often than not the whole yard stripped clean; then exotic vegetation brought in: Scotch Pines, Norway Maples, Japanese Azaleas, Mock-orange, Forsythias, Lilacs. Everywhere total replacement—not even a compromise between exotic and native vegetation. Americans simply do not utilize their wildflower resources. Yet there is still time to begin. . . .

●

two lilacs for the modern garden



Syringa velutina

photo courtesy of Royal Botanical Gardens, Hamilton, Ontario, Canada

Synonymous with spring is the lilac, a favorite, old-fashioned garden shrub. So many of us love the lilac but now relegate precious space to other spring flowering shrubs, while depending upon neighbors with larger properties for sprays of these fragrant flowers to use indoors. Unfortunately, as we become more urbanized, our gardens become smaller and the large, old-fashioned lilac shrub that was planted around the country home and barn is now part of our nostalgic, garden past.

Before World War II, when the lilac was popular, nurseries carried many species to choose from. Today the common lilac, *Syringa vulgaris,* is often the only type available to us if we buy locally. Why has interest in the lilac declined? Writing in *Horticulture* Magazine (June '74, "Updating the Lilac"), John C. Wister, an authority on lilac culture, and his wife Gertrude, suggested several reasons for the decline: competition from hardier plants, greater interest in wild flowers and rock garden plants, promotion by national, state and local plant societies of exciting new specialties including daffodils, irises, peonies, hemerocallis and chrysanthemums to name a few. But probably the most significant reasons cited are decrease in the size of gardens and the maintenance of these

by Judith Marden-Naftulin

Judith Marden-Naftulin is a student at Temple University working toward degrees in journalism and in horticulture. She has had articles published in *Plants Alive* magazine and the *Bucks County Panorama*.

vigorous growers.

Two excellent lilacs that get around the size and maintenance problem are relatively small and complement a garden design without taking over and becoming bothersome to care for. They are the Persian and the dwarf Korean lilacs, *Syringa laciniata*.

Syringa x *persica,* the Persian lilac may grow to 6 ft. but is usually smaller. Originating in China, this handsome plant has been in gardens for centuries and has proven hardy, except in the extreme south. The Philadelphia climate seems to be just to its liking. The Persian lilac has an upright habit, bearing small, pinkish-lavender flowers usually in late May, a little after the common lilac opens its buds. The small flower clusters are fragrant and are excellent for cutting purposes.

From *Syringa afghanica* x *Syringa laciniata,* the Persian lilac has variations of leaf form on any single plant. Along with the privet-type leaf is the jasmine-type leaf, with divisions that give the branches a very delicate look. Because of its jasmine leaf form, the Persian lilac is erroneously called the Persian jasmine.

Syringa x *persica* 'Alba,' the white flowering form of the Persian lilac, also bears branches covered with blossoms, perfect for cutting and bringing indoors. The small flowers are very white and are well set off by the plant's dark and delicate foliage. The scent of *Syringa* x *persica* 'Alba' is slightly sweeter than the pinkish form.

When thinking about how to use the Persian lilac in your garden, consider making the plant a specimen, using it within a small grouping of shrubs or as an informal hedge. Remember, the size of this lilac is not large enough to be used successfully in a shrub border for screening.

Another relatively small species of lilac is *Syringa velutina,* the dwarf Korean lilac, sometimes sold as *Syringa palibiniana.* This species is a true dwarf among lilacs, although an even more dwarfed form is being bred.

The dwarf Korean lilac is valued for its late flowering time compared to other lilacs. Blooming from early to mid-June, depending upon weather conditions, it complements the many other June flowering plants in the garden. The shrub grows to be about 3 ft. high and the same in width, bearing 6 in. long clusters of nicely scented flowers of a light purplish color. It is cold-hardy.

'Miss Kim' is a blue form of the dwarf Korean lilac. It is not a true blue but rather a light violet, fading to a bluish-white, somewhat difficult to describe, but very attractive.

Besides its small size, another good garden feature of *Syringa velutina* is its fall color. The leaves turn a bronze-red, a distinction among lilacs claimed only by it and *Syringa oblata dilatata.* It should be noted, however, that shrubs in poor vigor most often lack significant fall coloration.

It is easy to fit this particular lilac species into most gardens, since it is such a small plant. It can be a dense and compact specimen or used in front of a shrub border. For an unusual effect, try using it in a large rock garden as an accent plant. Its adaptability recommends *Syringa velutina* by those who love the lilac but do not want an overpowering, rampant grower.

companion plantings

Since both the Persian lilac and dwarf Korean lilac are deciduous shrubs without a lengthy flowering period, they should be carefully placed in the garden so that other plantings will be spotlighted when the lilacs are not in bloom.

A background of evergreens, such as junipers or yews, will enhance the colorful blooms of the lilac and also keep the solidarity of the garden in the winter, when only the bare lilac canes remain. Low, mounding forms of the juniper, planted in front of the shrubs, give a soft, flowing effect to the garden throughout the seasons. Certain bulbous plants will add variety to a garden of spring flowering lilacs. Late flowering tulips, as well as garden lilies in delicate shades of pink, lavender and creamy white, are perfect companions to sprays of graceful lilac blooms.

If you have space, varieties of viburnums and spiraeas bloom at the same time the Persian or dwarf Korean lilacs bloom. Not only do these other deciduous shrubs complement the lilac in beauty of flowering and foliage texture, but this is a time of delightful fragrance from the garden—a feast for the senses.

Actually, the list of companion plants for these two lilacs could go on and on. What is planted with them is a matter of personal taste, with garden space the only limiting factor to your creativeness.

As far as cultural practices, *Syringa* x *persica* and *Syringa velutina* are relatively easy to maintain. They do not seem to sucker as readily as other, larger lilacs, so do not encroach on other garden plantings. They are easy to prune to keep their shape and size. Thankfully, no ladder is needed to reach their tops to prune or spray. Like any lilac, they require a well-drained, slightly alkaline soil, plenty of sunshine (although they will withstand light shade) and enough room for good aeration. With care to cut off flowers before going to seed and renewal pruning of canes yearly, your lilacs will bloom more profusely every spring.

If you want additional information on these two plants, or if you have difficulty finding either of the lilacs to purchase, contact the International Lilac Society.* It is a relatively new organization for people who have a continued interest in all the various lilacs.

The International Lilac Society realizes the potential of new lilacs on the market. Soon we will have more dwarfed forms, those with variegated leaf color and even bicolored flowers. Much is left to be said about the future use of these favorite shrubs, whether they be old-fashioned types or the modern variations suitable for the smaller, urban garden.

●

*International Lilac Society, Incorporated, Walter Oakes, secretary, Box 315, Rumford, Maine 04276.

by Jan Riemer

Herb Reigns Supreme

The traditional American scarecrow, according to research conducted by the University of California, is effective against birds from only five to seven days, and often less. By the time we confirmed these facts, Herb had become a lovable personality, and we had become much too attached to consider removing him.

We first brought in Herb, our scarecrow, when we assumed it was the birds who were harvesting our plump fruits in the new strawberry patch.

I recalled childhood summers spent in rural East Hampton, Connecticut, where the scarecrow in the corn field was as environmental as the chicken coop and outhouse. Why not try a scarecrow in the strawberry patch?

He was assembled with two sturdy, man-size sticks that formed his body, while a crossbar served as arms; one last prop was added for general support behind the statue.

Fifty cents at a local garage sale produced a pair of coveralls. With more difficulty we confiscated our teenager's favorite tattered and revered shirt. In the attic was a fringed, hay-colored straw hat that was a replica of those worn by New England scarecrows. After stuffing his clothes with straw, his eyes and nose were formed by sewing buttons on an old sheet. An ingratiating smile was easily applied with a red magic marker. A blue and white bandana completed the effect we wanted.

As former Connecticut Yankees, now living in a Philadelphia suburb, it never occurred to us that in our new setting scarecrows might be exotic. He immediately attracted children, and stirred old memories in adults.

As we worked the garden, strangers would stop their cars with a word of appreciation. Inspired by such acknowledgements, my imagination began gearing up. First, "Scarecrow" needed a name. Because our herbs were flourishing, "Herb, The Herb Watcher," seemed fitting.

On the back of a metal sign that read "Rooms for Rent" we painted his new name and hung it around his neck. That proved successful until some mischievious neighborhood children flipped the sign over, and we were deluged with callers to rent rooms. The dilemma was eventually solved after we replaced the original plaque with a wooden one placed in the ground.

Herb was now becoming part of the family and we decided he should share each of the acclaimed holidays with appropriate costumes depicting the occasion. We began with Christmas when he became Santa Claus with boots, beard and full regalia. The first year was a disaster. Somebody dismantled him, strewing his clothes all over the garden area. Twice he was kidnapped by pranksters in a convertible and returned by the police who recognized him. No charges. Since then he has apparently achieved more respect, for many people stop to admire his varied wardrobes designed for New Year's Eve, Valentines Day, Easter, May Day, Memorial Day, Fourth of July, Labor Day, Halloween and Thanksgiving.

Twice he was kidnapped by pranksters in a convertible and returned by the police who recognized him. No charges.

Friends, neighbors and strangers seem to derive the most pleasure from seeing Herb on Labor Day as he reclines sleepily on a chaise lounge with newspapers and a can of beer by his side. The younger set takes more delight peeking through colorful, paper streamers where he has temporarily become a Maypole. If it should rain, which it often does, he's in a real predicament.

One year following Easter Sunday, I was removing the baskets Herb was holding and noticed an egg not belonging to our collection. Inside was a note written in a palette of pastels that read, "Dear Herb, you're a good egg. Happy Easter."

Weekly for two years, a woman and her invalid father drove by Herb on their way to the doctors. She stopped to express appreciation for the brief pleasure Herb provided on an otherwise unpleasant trip.

An out-of-state salesman, on his way to a meeting, noticed Herb and returned to take pictures to prove to his grandchildren that scarecrows do exist.

I should say here that our experience paralleled that of the University of California. The birds were not intimidated by Herb after a short period of time, costume changes notwithstanding. Another unsettling fact that came to our attention, much to our chagrin, was that it was white grubs, not birds, that were harvesting our strawberries planted on newly plowed land. In our case, ignorance was bliss. We lost the strawberries but gained a tenant.

Scarecrows originated in Greek mythology thousands of years ago. Priapus became the god to protect gardens, bees, goats and sheep when his father sent him to the fields because of his ugliness. He was honored with divine worship by the erudite until poets and authors treated him with crass humor. L. Frank Baum, in his Oz book classics, was among those who eventually escalated the scarecrow's image to one of dignity and imagination when he said in *The Magic of Oz*, "At Ozma's right sat the famous Scarecrow of Oz, whose straw-stuffed body was not beautiful, but whose happy nature and shrewd wit had made him a general favorite."

Throughout the centuries, scarecrows of various designs such as birds, animal and man have appeared in gardens the world over, while some of them appear along with other ephemeral folk in our museums across the country.

The Japanese Scarecrow Institute is probably the only one of its kind in the world with a membership of one person. Senji Katoaki works diligently talking to the farmers of the island asking them to reinstall scarecrows in lieu of noisy automation or unhealthy chemicals that destroy the land. He claims "scarecrows are the final remains of our ancestral sense of aesthetics, delicate without being pretentious, colorful, yet never loud."

Jan Riemer is a frequent contributor to *Green Scene*.

●



THE NORTHERN CUSTARD APPLE



Fruit cluster of the pawpaw or northern custard apple. photos by M. M. Brubaker

by M. M. Brubaker

In some localities where it is native, the northern pawpaw, *Asimina triloba,* is more maligned and also more extolled than any other fruit. One of the reasons for this sharp difference of opinion is a wide fluctuation in the flavor of these banana-tasting fruits. Some are so good, in my estimation, that they should be classed with the great fruits, and deserve intensive breeding effort. Others have a strong resinous flavor that is repulsive. For some tastes the pawpaw is a little too generous in the use of its flavoring components. Many of our best food flavors are obnoxious when concentration of the flavoring component is increased. We should compensate for the pawpaw's excesses.

One way to compensate is to use the fruit before it becomes too ripe. Most literature advises that the fruit is ripe when it turns dark. Pawpaws from my trees are quite mild and sweet when the fruit first ripen. That is at the stage where a yellow tinge just shows over the green, where the fruit

just begins to feel a little soft and breaks off easily. As ripening proceeds, the flavor strengthens. Finally the fruit becomes black and the flavor becomes offensive. Many who malign the pawpaw tried it in this overripe condition.

Another compensation for the pawpaw's over-abundance of bouquets is to attenuate the flavor by combining with other foods as we do vanilla. I'll have a suggestion along this line later.

Propagation and transplanting of the pawpaw tree has given considerable trouble, and nurseries shun it for local sale. A few mail order nurseries list pawpaw seedlings in their catalogs, but it is doubtful whether many who buy the trees succeed in establishing them. John Hershey, who ran the Nut Tree Nurseries in Downingtown, used to recommend digging a post hole, setting in the spike root, and then filling in with vermiculite instead of soil.

Other fruits, like apples, pears, and peaches, have been commercialized by asexual propagation of a few more desirable seedlings that were tediously selected from many thousands. Some of the best pawpaws were searched out by the late G. A. Zimmerman of Pikestown, Pa., but because of the difficulties of asexual reproduction were never commercialized. A superior variety called 'Davis' is available, however, for those who wish to try their luck at transplanting.

For the home gardener, the simplest method of establishing pawpaw trees is to plant seed from a strain that bears superior fruit. The seeds don't always sprout well. One opinion cited in the U.S. Department of Agriculture Publication No. 654, *Woody Plant Seed Manual,* is that fermentation associated with the rotting pulp is necessary for germination. I have been able to get reasonable germination by the following proceedure: Every bit of the good fruit is sucked off seeds, and without drying, they are put into the refrigerator for the winter in a plastic bag with moist sphagnum. In spring the bag of seeds is taken out of the refrigerator to warm, and examined from day to day. As individual seeds are found to have sprouted, they are planted in peat pots using a peat-lite type of growing medium. Seedlings should be set into their permanent outdoor spot as soon as they have a few leaves, so that the root will not be significantly disturbed. The trees cannot be transplanted very successfully after they become established.

Pawpaw trees will bear fruit in the shade. They perform better, however, with more light and will withstand full sun as they mature. Seedlings should be shaded at first. The books say that the trees must grow in a rich, fertile loam. I have one tree growing and bearing exceptionally well in sun and in about as poor soil as anybody could want. I do pamper my trees with a little manure on the ground underneath in spring.

Wood of the pawpaw is so repulsive that no animal will eat it. The tree can therefore be grown safely in a pasture with your goat. Don't, however, trust a rabbit.

Pawpaws will withstand quite severe winters, but those trees native to different parts of the country may vary greatly in their dormancy requirements. Trees from the north may fail in a southern location because they require severe cooling in the winter to break their dormancy.

Wood of the pawpaw is so repulsive that no animal will eat it. The trees can, therefore, be grown safely in a pasture with your goat. Don't, however, trust a rabbit. His hobby is chewing, and he only eats when it seems like a good thing. Young trees must be protected from rabbits. I have not yet encountered any insects or diseases on these trees that were serious enough to require spraying.

William Henry Chandler in his book, *Deciduous Orchards,** says pawpaw trees are slow growing, slow to come into bearing, live long, and are beautiful. The particular strain of trees I have been growing is not slow to come into bearing. The attractive, puce colored flowers appear on trees only 5 or 6 ft. high. However, I have never seen more than a rare fruit through natural polli-

continued



Pawpaw flower

*Published by Lee & Febriger, Philadelphia, 1951.



Asimina triloba fall foliage is a lovely golden color.

nation. Those creatures ordained to pollinate pawpaws are not around my place. Furthermore, selfing flowers on a single tree has given a very poor yield of fruit. Cross pollination between different trees has been necessary for a decent crop. Spraying flowers with a hormone, like Blossom Set, has not produced any fruit.

One spring a small boy came wanting a job. This touched me deeply, but I didn't have much for him to do, so I asked him to sex up the pawpaws, and showed him how. Yield of fruit that year was better than it had ever been.

The manner of cross-pollinating flowers may be quite important although I have no controlled experiments to offer. I do get a large crop of fruit, however, and that is not common on pawpaws. The pollen apparently matures after the stigma on my trees. I select flowers that show powdery, loose pollen; bend back the petals carefully so pollen doesn't shake off; and jab the pollen onto the stigma of a fully open flower (on another tree) which hasn't yet released pollen. The result should be big bunches of six or eight of those wonderful custard apples in late September or early October.

Many kitchen formulas have been suggested for the use of pawpaws to flavor such desserts as cakes and puddings. One of the most delightful attenuations of the pawpaw bouquet is, in my opinion, its use in ice cream. For an easy-to-make ice cream, put into a blender:

10 oz. package of fresh pitted dates
3 large eggs
1 cup coffee cream
½ cup pawpaw pulp

Comminute (make into small particles) thoroughly, and then take out into a bowl and fold in:

½ pint whipping cream, whipped stiff

Put into the refrigerator and freeze. This will come out fairly fine grained without the need for beating in the partially frozen stage, as usually recommended for refrigerator ice cream.

M. M. Brubaker is a frequent contributor to *The Green Scene*.

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Rose 'Silver Moon' at Wyck.
See page 5.



PROPAGATION ISSUE

THE green scene

HORTICULTURE IN THE DELAWARE VALLEY

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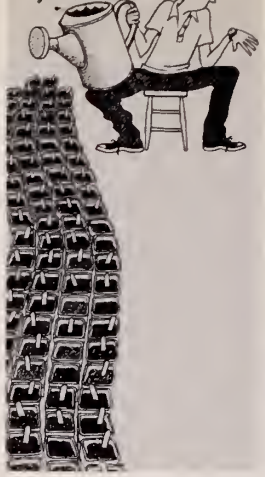
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THE
green scene

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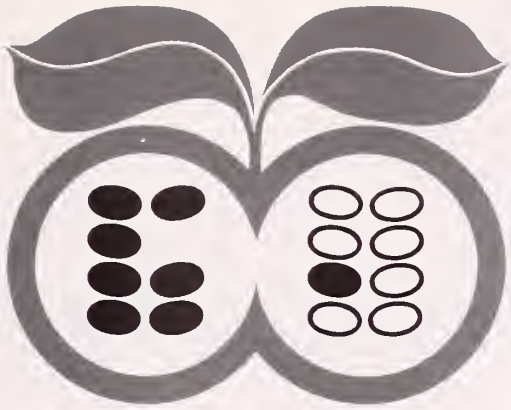
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Front Cover:	The snapdragons, marigolds, dahlias, petunias and ageratums in this Chestnut Hill area garden were all grown from seed by the author Frederick Peck. See article page 9. photo by author
Back Cover:	photo by Charles W. Heuser

correction:

The roses identified on page 9 of the May *Green Scene* are *Rosa setigera* not Rose 'Bella Donna.'



PLANT PROPAGATION

Our custom, if a four-year-old can be permitted to claim that it has customs, is to devote our summer issue to a single subject. In 1973 and '74, it was pruning; last year, soil; this year, propagation. This custom has proved both challenging and rewarding. When a number of horticulturists address themselves to the same topic, albeit to different aspects of that topic, the combined effect tells us things about horticulture and gardening that we might not learn by reading the same articles apart from one another.

This issue provides an illustration. One author says he never sterilizes the medium he uses for seeds. Another tells us, in effect, that sterilizing is one of the propagator's ten commandments. Thus, we learn that horticulture is not a simple set of rules but a combination of knowledge and skill, learning and observation, science and hunch. There is no single correct path, if for no other reason than that there is no single goal. The method I use may be far too tedious for you. The important thing is for each of us to develop the practices that suit our needs.

Thus, as to sterilizing soil, different reasons impel our authors to different theories and practices.

Amateurs, who usually propagate in small batches under relatively simple conditions, seldom sow more than a small number of seeds of any one kind of plant. Commercial growers, on the other hand, propagate intensively and the risk of a massive and devastating infestation is greater. This is not to say that the loss of a single rare or irreplaceable seedling to damp-off is not as distressing to the amateur as are whole flats of common petunias to the commercial grower. It is, but it is a distress of a different kind!

So, perhaps there is a lesson here. Before you blindly copy down do's and don't's from any source—even PHS—reflect for a moment on their suitability to you. Compare the author's circumstances and objective, and indeed his or her horticultural philosophy with your own. Such reflection may help you develop a workable rationale for your endeavors.

Truly, ours is a complicated avocation. But then, that's what makes it interesting.

Ernesta D. Ballard
President

pleasures and pitfalls



Fig cuttings root fairly well under a variety of conditions. Here the author put three cuttings in Peat-lite in a pot and got two rooted plants.

by M. M. Brubaker

M. M. Brubaker, a frequently successful propagator of exotic plants, claims that he has maintained humility throughout his numerous experiments. He says that the moment he is inclined to brag, something goes wrong. He advises propagators not to be discouraged but to develop a workable balance of confidence and humility.

photos by M. M. Brubaker

Successful propagation, like raising anything from ginseng to chinchillas, is a matter of learning how and attending to essential details. Those who take up horticulture in a serious way, either as an amateur or professional, are sure to encounter many humbling experiences. Most likely it will be some aspect of propagation that will jolt a gardener's pride very early. The determined amateur, however, can master all the techniques of the professional.

Propagation from seed, sexual reproduction, gives results sharply different from other methods classed as asexual or vegetative reproduction. In sexual reproduction, generally speaking, no two seedlings are alike or like the parents.[1] Some strains of commercial seed are quite homozygous, and produce seedlings that are hardly distinguishable from each other, but they are not likely to be identical. On the other hand, most seeds collected by the amateur gardener are heterozygous and vary widely in their characteristics. For example, the seeds from a large, incurved chrysanthemum will likely give as low as 15 or 20% incurves resembling the parent. Many of these seedlings may bear smaller, single flowers that look like daisies.

The variation of seedlings is advantageous to the plant breeder who is interested in discovering new and better individuals. He grows thousands of seedlings, selects a superior individual, and propagates that by one of the asexual methods mentioned below, to obtain a quantity of identical plants.

[1] A rare exception is the case of apomixis where the pollen has not contributed any genetic factors. For example, attempts to hybridize amaryllis sometimes gives seedlings that are all identical with the mother plant.

of propagating plants

Another important characteristic of seedlings is their vigor and in many cases freedom from debilitating viral diseases and serious weakening. In asexual propagation this weakness is transmitted unabated.[2] Propagation from seed, on the other hand, may eliminate the virus even though parents are infected.

Efforts of lone gardeners planting seeds have contributed many of our improved plants. An example is our peaches that are unlike those brought over from China. The Chinese peaches were not well adapted to our conditions. However, seedlings produced surprisingly good fruit and the early practice of planting small orchards with peach seeds led to many superior clones that thrived in this country.

Some of the most beautiful ornamental trees give consistently good seedlings. So many friends admired my Chinese dogwoods *(Cornus kousa)* that each year for a number of years I sprouted a batch of seedlings to give away. One of those gifts eventually came to the Arnold Arboretum, was considered worth asexual reproduction, and was named *Cornus kousa* 'Steeple.'

To cope with adversity and to insure survival a strange array of conditions has evolved to enable certain seeds to germinate successfully. For example the babassu nut must rot in a tropical Brazil forest for 15 or 20 years before sprouting naturally. Seeds of some cotoneasters must progress through a cold period, then a warm period, and then another cold period before they will sprout. Some lily seeds must have a root development period and then a dormant period before they will appear above ground. Other seeds must be associated with a fungus before they can grow. Seeds of the common ragweed lie dormant underground for many years. When the ground is cultivated, they are exposed and sprout. I failed in a number of attempts to sprout more than an occasional Bells of Ireland seed in the greenhouse. I tried sterilized soil, garden soil, fungicides, stratification, freezing, and both judicious and careless neglect. Finally I noticed that I could find myriads of Bells of Ireland seedlings that came up as weeds in the plowed garden at locations where they had been growing several years previously.

Seeds generally germinate best in a medium that is low in electrolytes (soluble minerals and fertilizers), high in organic matter or water holding capacity, and free of parasites.

Most woody seeds require one to three months of moist refrigeration (stratification) to break their dormancy. A U.S. Department of Agriculture publication, *Woody-Plant Seed Manual,* gives a fund of information on growing shrubs and trees from seed. Some commercial catalogs give good information on handling herbaceous seeds. An outstanding example is the catalog from Stokes Seed Co. of Buffalo, N.Y. 14240.

Asexual reproduction. Evolution and natural selection of seedlings has presumably yielded the best strains, at least from the standpoint of survival in a given location. Humans, however, have different ideas and have selected those they have judged to be superior individual seedlings. They then reproduce these superior selections precisely, using asexual or vegetative methods of propagation. There are, of course, many cases in nature of this asexual reproduction.

Divisions of plants occur in nature, and we have adapted this division method extensively for duplicating better plants. Division is usually the easiest method for vegetative propagation of herbaceous perennials. It is not, however, always the best. For example, poorer mums generally result from plants carrying old roots than from newly rooted cuttings. Shrubs, such as lilacs, can be multiplied by separating a basal growth with some roots. Trees that tend to sucker at the base can be multiplied by such a division, but the division should come from above a graft or the new tree will be like the roots, not like the top. Trees can have unexpected roots. The named varieties of medlar *(Mespilus germanica)* are usually grafted onto hawthorn roots.

Layering, or the formation of roots on a growing stem, has many analogs in nature. Vines, like ivy, take root any place on the stem. Some viburnums and raspberries form roots naturally on the tips of branches that touch the ground. It is easy and practical to bend down branches of many plants, and cover a part with soil. As soon as roots form underground the branch can be cut off and transplanted. This method is the basis for a number of nursery practices for commercial propagation.

continued

[2] A laboratory form of asexual reproduction, meristem culture, can eliminate virus. See article on page 24.

propagating plants

Air layering is said to have been practiced by the Chinese more than 5000 years ago. This above-the-ground layering is more practical when a branch can't conveniently be covered with soil. A wounded section of the branch is covered with moist sphagnum to induce roots. I don't believe air layering is now used commercially in this country but is a common practice in arboreta and private gardens. The gardener can make fine use of this technique for occasional duplication of trees. (See *Green Scene,* May '74.)

Cuttage is the process of first severing a branch, bud, leaf, or root from a plant, and regenerating that piece into a complete new plant. It should be possible to multiply any plant from cuttings if we know the proper conditions. In a number of cases those conditions have not yet been found. Nevertheless, rooting cuttings is so adaptable to mass production in the nursery business that it is the source of many of the plants we buy.

Propagation by rooting cuttings is as useful to the home gardener as to the professional, even though the gardener may not wish to install such sophisticated equipment as automatic misting. Inexperienced gardeners can root broadleaf evergreens like holly and camellia quite successfully. A friend of mine once expressed a desire to start some hollies from cuttings. I showed him directions in an Arnold Arboretum Bulletin for use of a plastic covered flat in a shady outdoor spot, and gave him a couple dozen holly cuttings. He got 100% rooting and a beautiful group of holly plants. I envied his success.

The nursery practice of selling a quantity of rooted cuttings from a single plant often results in absence of fruit. For example, the leather-leaf virburnum *(V. rhytidophyllum)* is not usually self-fruitful. Two plants from cuttings of the same stock plant are not different, and are not likely to bear fruit; there must be two different plants near each other for fruit. Another example is the aucuba *(A. japonica)* which should bear large, spectacular berries. The nursery plants are usually all female rooted from a single stock plant. These do not bear fruit without a male companion, which can be difficult to find.

Some trees and shrubs can be propagated from small sections of root cut off underground near the main stem. In fact that may be the only easy way to multiply superior clones of the northern custard apple *(Asimina triloba).* As noted in the section on division, the use of root pieces for propagation will not duplicate a tree that has not been grafted, since the roots are different from the top. Another unexpected difficulty is that the roots of some trees differ from the tops even though they have not been grafted. These are chimeras that are made up of tissues having different genetic character. For example, propagations from the roots of the common Burford holly, a periclinal chimera, will not give a Burford holly, even though the tree is on its own roots, since the roots and top come from different circles of stem tissue.

In woody plants there can be an important difference between juvenile and adult wood. Sprouts from the base of a tree (presumably juvenile wood) often root easily, even though the species is considered difficult to propagate by rooting cuttings. *Cornus mas,* the attractive late-winter flowering tree with edible fruit, illustrates a striking difference between juvenile and adult wood. Seedlings bear only male flowers for many years. Finally the flowers develop female parts and the tree bears fruit. Cuttings from this mature wood give trees that bear fruit early. Ordinary English ivy *(Hedera helix)* is the juvenile form. Very old vines start to bear flowers and fruit. Cuttings from this reproductive wood form bushes, not vines, and continue to bear flowers and fruit. Still another example of this difference in wood from different parts of a plant is found in the Norfolk Island pine *(Araucaria excelsa)* on which the leader growth and the side branches are different. Cuttings from side branches form loppy, unsymmetrical trees.

Once when I visited Joseph Gable, an azalea hybridizer in Stewartstown, Pa., he was excited because a rhododendron he had grown from seed for 25 years had just come into flower for the first time. He expected that cuttings of mature wood from this plant would now produce flowers after only a few years growth.

Hormones (like indolebutyric acid for example) generally hasten initiation of roots. There is, however, a wide variation in plant responses to these hormones. Some plants form roots about as well without them as with. Even though the hormones may hasten initiation of roots, they tend to slow down subsequent growth. It is desirable, therefore, to learn exactly how much and when to use them. Avery's book, *Hormones and Horticulture,*[3] gives a pretty complete table listing this information as of 1947. The University of Massachusetts Experiment Station Bulletin No. 491, *Propagation of Woody Plants by Cuttings,* by William Doran (1957), also gives valuable information on this subject.

In much of the scientific literature on hormone treatment of cuttings, a solution of the hormone is used, into which the cuttings are dipped for a timed interval. This procedure is more precise for experimental purposes, but the solution is less convenient than the commercial powder. One advantage of

[3]By George S. Avery, Jr., and Elizabeth Bindloss Johnson, McGraw-Hill Co., Inc., N.Y., 1947.



Snapdragon seedlings about to be transplanted into the row garden for cut flowers.



About the easiest garden flower to propagate from cuttings is the chrysanthemum. Here mums are being rooted in perlite in plastic trays.

using commercial hormone powder is that it contains a fungicide. Also, the hormone solution is more likely to spread virus than the powder when cuttings from a number of different plants are treated. Virus can also be spread from the cutting tool, and the meticulous propagator sterilizes his knife (with a pocket cigarette lighter, for example) before each different plant is cut.

Graftage usually consists in fitting a more desirable ornamental or fruit-bearing top onto an appropriate stock plant. Like the other methods of asexual propagation, it is an ancient art. Grafting is viewed today as a laborious method of propagating, and it is avoided where other methods can be used. Most grafting is now left to wholesale propagators of the most salable trees. Local nurserymen merchandise these trees but few now do any grafting. A wide variety of flowering cherries were formerly available, but it is now difficult to find anything except the most popular 'Kwanzan' and weeping cherries. Even the weeping cherries are being grown from seed, but are generally quite inferior to trees produced by grafting the best clones low down, followed by proper training. Where could one find for sale today the single, white flowering cherry 'Tai Haku' about which Collingswood Ingram said, "for quality and size of flower it stands sùpreme"?[4]

Grafting is the only practical method of propagating most superior fruit trees and the best clones of many ornamental trees. It is not well adapted to impulsive action, however. It generally takes some forethought because a seedling tree is required on which to graft the desired clone. Furthermore, for grafting in spring, dormant scions must be collected and refrigerated. The amateur can best succeed by bud grafting in late summer and fall. Bud grafting is done by inserting a single detached

continued

[4] *Ornamental Cherries,* Collingswood Ingram, Country Life, London, 1948.

propagating plants



Tomato, pepper and ageratum seedlings that have been germinated in plastic trays.

bud underneath the bark of the stock.

It is interesting to read about the practice some years back of making over a whole apple orchard by top-working all the mature trees with scions of a new and superior apple. The art of grafting had many more practitioners for such an operation than we have now. Nevertheless, for amateurs considerable interest in this art still radiates from such organizations as the North American Fruit Explorers[5] or the Pennsylvania Nut Growers Association.[6] Interested amateurs could benefit from membership.

One of the pleasures of horticulture as a serious hobby can be searching out, in old collections, fine, neglected clones of flowering trees such as Japanese cherries or old fruits such as medlars, and rescuing them for another generation, by grafting.[7]

For centuries the waxing and waning of the moon has been used as a guide to the proper time for propagating and harvesting. These moon events often come at inconvenient times. I suggest, therefore, you turn to the planet Venus, and consult her brilliant, moon-like crescent. When the cusps of the crescent are pointing straight down, propagation is propitious. When Venus is in syzygy or gibbous, the conditions are obviously ideal for propagation. Whether you are guided by the moon or Venus, propagation of plants is an exciting, profitable and sometimes even therapeutic hobby.

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clone: any plant propagated vegetatively and therefore presumably a duplicate of its parent.

George H. M. Lawrence, *Taxonomy of Vascular Plants,* Macmillan & Co., New York, 1951.

[5]Robert Kurle, Secretary, 10 South Madison Street, Hinsdale, Illinois 60521

[6]Albert L. Magee, Secretary-Treasurer, Pennsylvania Nut Growers Association, R.D. 2, Duncannon, Pa. 17020

[7]In 1973 an entire orchard of old and unusual apple varieties was moved by the Worcester County Horticultural Society to the Old Sturbridge Village Preservation Project. This was done by using scions from the old trees grafted onto new root stock. The young trees were then transplanted to the new location. Nearly 100 old apple varieties have been preserved in this project.





by Lee M. Raden

Lee M Raden continues his active interest in growing some of the more exotic alpines from seed.

GROWING PLANTS FROM SEEDS

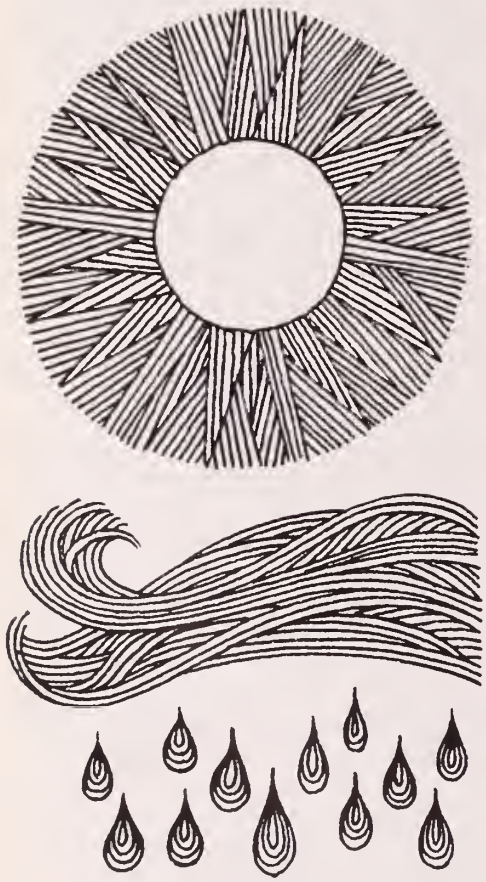
One of the things that particularly fascinates me is the "cast-in-bronze" statements we make in writing about our hobby. In January 1973 I wrote an article on seeds in the *Green Scene* and in reading it over I feel that many of the things that I said are still valid, but I have changed my mind about some techniques in seed handling.

Why grow plants from seed in the first place when it is so easy to buy plants at your local nursery, get them from your best friends, steal them from your enemies, or just hack them apart and divide them? The answer to these questions is easy. Absolutely no form of gardening brings greater pleasure than growing your plants from seed. There is a magic in growing plants from seed, and part of the magic is water. A completely dry seed is in suspended animation, and water recharges it and starts a wonderful chemistry. Molecules of water begin to penetrate the outer coat of the seed, and when this water content reaches somewhere in the neighborhood of 8% of its total bulk the seed will begin to stir. When the water content reaches 12% germination and growth begin. Once this germination and growth begin then we are in a do-or-die situation. If we do not water the little seedlings properly they will slowly burn up their food reserves and die. Therefore, rule number one is: once you start watering the seeds they must never be allowed to dry.

When do we sow the seed? We sow the seed when we get it. If it's seed for vegetables, or annuals for the garden, we generally order them for the proper time for sowing. If we get the seed before it should be sown, it should be kept in some type of waterproof container such as a jar. However, if it's seed that must be stratified or

continued

There is a magic in growing plants from seed, and part of the magic is water. A completely dry seed is in suspended animation, and water recharges it and starts a wonderful chemistry.



chilled, it is best kept in the refrigerator, in a jar, until sowing.

I don't use sterilized soil. It doesn't occur in nature and, quite frankly, the average gardener or horticulturist does not need it. The real super secret is a light, porous, extremely well-drained medium; a medium that allows good oxygen retention, water drainage and has a rich nutrient base. Such a medium is needed for the seedling roots to spread and feed. A good seed soil mixture is composed of 1/3 to 1/2 stream sand and the balance a mixture of garden soil and compost. A major change in my thinking since 1973 is that I never incorporate peat of any kind in my seed pans. Seeds of the *Ericaceae,* and their seedling plants, do not need peat. Peat retains too much water and is a major cause of damping-off. I am assuming that we all have a source of compost; if you do not, then go out into the woods, get permission from the owner, and use some of that marvelous hardwood forest duff for your compost, **but use compost.**

In blending the above-mentioned soil mixture it should not be tamped or crushed. It should be aerated by throwing it up in the air; never screen the mix. Gently pour into the seed pans using a broad trowel. In place of tamping, shake the pan gently to obtain a level surface. Now sow your seed as uniformly as possible on the top of this mixture. If the seed is large, very carefully cover it with some coarse stream sand. If the seed is fine, mulch the top lightly with 1/8 inch stone chips or aquarium gravel. Water thoroughly from the top using a fine nozzle. That is how nature pushes the seed into the soil.

Now a constant vigil must be kept. The seed pans must never be allowed to dry out and they should be stored someplace out of the sunlight, but in a light area. I never cover seed pans with newspaper, polyethylene or glass because proper air circulation is important and in a closed atmosphere with 100% humidity it's asking for trouble. When the seed germinates in a highly humid atmosphere "damping-off" is usually what happens.

When germination occurs the plants must be moved to much stronger light, preferably to sunlight, for part of the day. Good ventilation is now all-important, and we must make sure that we have these last two factors in balance or plants will stretch from lack of light and you will never have strong seedlings, or they will damp-off. In my own experience, if your watering schedule and light and air circulation are correct, then your reward is an astounding growth of the seedlings.

Many experts say that when the first true leaves appear after the dicot or monocot stage, the seedlings should be pricked out. I never prick out plants at this stage. I let them fight their way in the container to the bursting point. Dry the seed pan out for a day or two. What a pleasure to untangle a mass of healthy roots as compared to our weak first set of true-leave plants that you automatically overpot no matter what size pot you use, or lose them in the garden.

After this initial transplanting, give the plants about a week to recover. They will let you know their vigor is renewed by their color and general appearance. If you just took the seedlings directly from the seed pan to flats, or directly into the ground, fine, but let's be smart. Modify that garden soil or soil in seedling flats with sand. In our Delaware Valley soil I have found that it generally must be lightened considerably. If you will work sand into the soil and transplant on a day that is cloudy, you will find that there will be very little transplant shock if the plants are amply watered-in. Watering continues to be all-important until the plants are fully grown; and if you have proper drainage through the addition of sand, you cannot overwater or sour the soil. A top dressing of stone chips is as good for roses as it is for conifers or for very fine alpine plants. You will be keeping the neck of the plants dry, the soil will be cool, and there will be no soil spattering in the event of a thunderstorm.

From an expense viewpoint there is nothing cheaper than water. All plants need it for growth and the absorption of nutrients from the soil. You cannot over-water if you have proper drainage.

Fertilizers — use one with a low nitrogen content and cut the recommended manufacturer's dosage in half. If the seedlings are healthy the halved dosage will be ample.

Happy gardening.

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GROWING GARDEN ANNUALS FROM SEED

The quality and quantity of ready-grown annuals on the market has increased greatly in recent years. But it is still not always possible to find the exact varieties you are looking for. In addition, the increased cost of labor and materials has pushed up considerably the tab for the available plants if you are doing a large planting. By growing from seed you widen your selection, save money and achieve greater satisfaction in your gardening accomplishments.

Although it is possible to have some success simply by sowing seeds in the open ground in the middle of May, the results are usually less than stunning, and it is midsummer before much color appears. With the price of seeds painfully higher than a few years ago it is important to get maximum germination and development out of each packet. Another consideration is timing; that is, how do you propagate plants so that you will have them when you want them rather than leaving yourself entirely at the mercy of commercial growers' schedules.

equipment

The equipment necessary for growing annuals from seed is minimal and easily available. Although a greenhouse enlarges the possibilities it is not needed to grow many of the popular and satisfactory plants.

Here is a list of some of the equipment you will need for good results.

- Plastic seed pans (scrubbed clean and with holes punched in the bottom to drain off excess moisture).
- Redi-Earth (or an equivalent) and No Damp-Off Sphagnum (an inert, sterile soil mix that is weed-free, holds moisture evenly and long, and is easy to work with). Regular garden soil is almost never suitable as is, and by the time you make it so you might as well buy the prepared stuff.
- Fluorescent lights or a bright warm windowsill.
- Bottom heat in the form of an electric cable in a tray or bench, or from a radiator if the heat can be controlled to be gentle and moderate.
- Kitchen knife and fork
- An atomizer for watering
- Soluble fertilizer
- Good fresh seed from a reliable source

procedure

Fill the seed pan with the sowing medium. Place in a flat dishpan or laundry tub of warm water in which a tablespoon or two of soluble fertilizer has been dissolved. The fertilizer will provide nutrients for the plants through their early life. The Redi-Earth will soak up the water from the holes in the bottom of the pan, it will resist water from the top until it is thoroughly wet. It may be necessary to weigh it down at first with a few stones or a moderately heavy object. When the soil mix is puffed up remove it from the water and let it drain out for an hour until it is damp but not sopping. If you use the sphagnum, it will speed up the process if you knead it to get it wet.

Observe how many seeds are in the packet; that information is on most seed packets today. Perhaps the pan will accommodate more than one packet. Using the kitchen knife make shallow indentations an inch or two apart to form rows in which to place the seeds.

Now sow the seed in the furrow spacing the seeds ½ to ¼ in. apart. Take some of the mix and cover the seed about two or three times its diameter. This is done with your fingers or the fork. Do not press down.

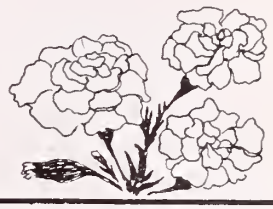
Spray the dry part gently without disturbing the seed. Cover with wax paper more or less tightly and place on

continued

by Frederick W. G. Peck

Frederick W. G. Peck is a landscape architect, member of the American Society of Landscape Architects, formerly served on the Council of the Pennsylvania Horticultural Society, Board of Directors of Morris Arboretum Associates and the Board of Directors of Chestnut Hill Hospital.









the windowsill, tray or bench or on a pebble-filled tray under the fluorescent lights. It is not necessary to turn on the light until germination begins. Note each variety with a Magic-marker on the seed pan.

The optimum **temperature** for most flower seed germination is between 65° and 75°F, usually about 70°. Colder temperatures will delay but not necessarily prevent germination. However, results are best when germination is as rapid as possible. If it is too slow the seed sometime rots away or the plant may become weak and disease-prone. (See damping-off article on page 18.)

Remove the wax paper cover immediately after germination to encourage **air circulation**. Keep the mix damp but not wet by spraying when necessary with warm (room temp.) water from the atomizer. Water in the morning rather than the afternoon. Keep the seedlings out of direct or hot sun; it will scald them.

Occasionally—every three or four waterings—add a little soluble **fertilizer** to the water in a weak solution, one-half the strength recommended on the container.

As the plants develop their first true leaves you will have to decide whether to thin them by destroying some or to keep them all. If it is close to planting-out time you may choose the latter. But keep in mind that if the seedlings are too crowded they will not develop into good plants and in pulling them apart you may destroy them later.

Steady **moisture**, if not excessive; steady **light**, if not too bright; and steady **fertilizing**, if not too powerful, should bring the plants along to perfection. They will then be ready to put directly into the garden or into containers or flats.

The timing of all of the above will depend on your space, your equipment (greenhouse or not?) and your special garden requirements. If it is a windowsill situation with no possible intermediate transplanting, it will be best not to start too soon, sometime between April 1 and 15. Slow growers like begonias and geraniums can be started a month sooner. If you have a greenhouse all operations can be advanced a month or more.

success story

Here is a short list of some of the plants that I have grown successfully from seed following the above procedures:

Geraniums — new hybrids not usually available at plant markets.

Impatiens — in quantity because it is such a useful plant to use lavishly.

Cosmos Bright Lights and Sunset — because they are usually not available any other way.

Zinnia Carved Ivory — at 3¢ to 5¢ per seed, no wonder they are expensive to buy as plants.

Dahlias — not dinner plate size but Redskins and Unwin Dwarf hybrids.

Begonias — Muse Rose, Danica Red and Danica Rose from Suttons are superb bedding and pot plants. Inexpensive if grown from seed.

Petunias and snapdragons — these are usually available in the market in good varieties.

Marigolds and zinnias — increasingly available in the market but new hybrids frequently not.

A few words should be said about bachelor buttons (centaurea), California poppies (escholzia) and Shirley poppies (papaver). Since none of these transplant well, the best way to handle them is to sow them broadcast in the late fall, or in the snow, or in very early spring where they are to bloom. The birds get a lot and a lot are lost but they are not expensive seeds.

And finally, just a word about calendulas, one of our best picking flowers. They do not bloom well in the heat of summer so the seed should be planted in late June or early July outdoors and you will have a great crop of gold by late summer until killing frost.

Seed Sources

W Atlee Burpee
Warminster, Pa. 18974

Joseph Harris Co., Inc.
Morenton Farm
Rochester, New York 14624

George W. Park Seed Co., Inc.
Greenwood
South Carolina 29647

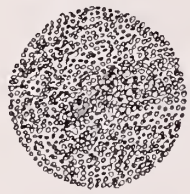
Sutton Seeds
161 New Bond Street
London, England W1













Sphagnum Moss Inhibits Damping-off

Sphagnum moss is great for germinating seeds if you want to avoid damping-off. Just don't sterilize it or you'll kill valuable bacteria in the moss that inhibit the growth of fungi that cause damping-off.

The fungus inhibiting bacteria was isolated at Purdue University and reported on by researchers Gayle Fleming and Charles E. Hess at the 1964 Annual Meeting of the International Plant Propagators Society. They isolated the bacteria from a water extract prepared from the ground sphagnum moss and found that it inhibited the growth of *Pythium, Rhizoctonia* and *Fusarium*, organisms that cause damping-off. Their research meant that growers could significantly increase their rate of seed germination.

dividing perennials . . . heirlooms of the garden

by Ed Lindemann
PHS Horticulturist

The herbaceous plant material that grows in perennial beds produces underground stems or eyes. The new shoots grow as individual plants, but are still attached to the parent plant causing it to constantly increase its size. Because of this constant increase regular division is necessary for most perennials. With age, the centers of perennials tend to become woody, decline and fail to produce vigorous foliage and blossoms As the clumps in a perennial garden continue to grow they eventually fill up available space and overcrowding becomes a problem. Periodically dividing perennial plants will keep them healthier and more attractive. In addition, division is an easy way to increase your own supply of material and to share with friends.

Various gardening references give long tables or charts stating when each variety of plant material should be divided. Often the recommended times differ from one reference to another. I have a general rule that works for me and is easy to remember. I divide perennials after their period of bloom. Early blooming primroses are divided after their flowers fade in late spring. Summer blooming bearded irises can be dug, divided and reset in mid to late summer after their flowers have faded. Fall blooming perennials such as chrysanthemum often bloom up to a hard frost and therefore are divided the following spring. Never divide a plant that will have less than six weeks to reestablish itself before the ground starts to freeze.

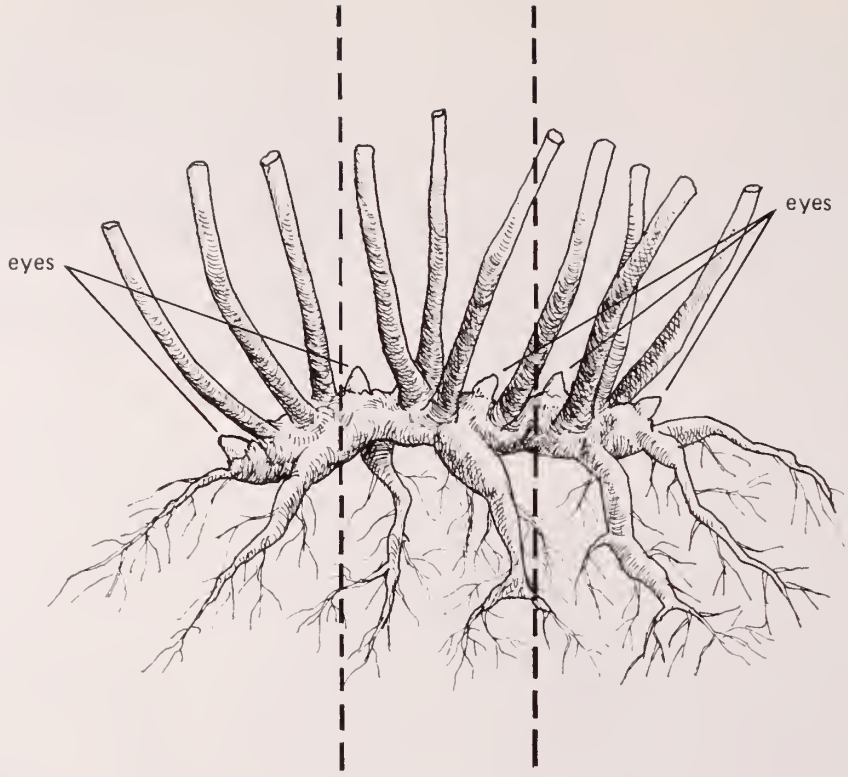
Shallow rooted perennials seem to withstand dividing with little difficulty at almost anytime during the growing season. I have to admit that if a special plant is found or offered I do not hesitate to attempt to divide a piece of it; however, if it is the wrong time of year I do not remove the parent plant, but simply remove a small section from the perimeter of the clump with a sharp tool taking care not to disturb the main root mass. If done carefully this practice works well when sharing plants. My favorite perennial, *Coreopsis verticillata,* is the most admired plant in my summer garden and I have sent many a small clump in full bloom home with visitors and have never heard of a transplanting failure nor has it ever affected the parent plants



As a general rule most perennials should be divided every three years; however, there are always exceptions. Chrysanthemums should be divided every year and peonies that take three or more years to become established should be left in place for a decade or more. The dividing time schedule will vary with different plants and if uncertain it is best to check a reference source.

Because of the amount of work involved, I find it easier to work on an entire bed at once. The first step is to dig and remove as many plants as it is feasible to handle in a given amount of time. Set the clumps out of direct sun and cover with pieces of wet burlap to prevent the roots from drying out. If you are able to work on an entire bed or a large area of one, it is best to renovate the soil after the plants have been dug. Turn the soil over

continued



Dividing perennials — note eye.

to a depth of 18 in. with a spade or digging fork and incorporate some organic matter such as peat, humus or compost. Work in some low nitrogen fertilizer to promote good root development. Two or three pounds of 0-20-20 per 100 sq. ft. will do for an existing bed. New beds should have slightly more fertilizer added. If only certain plants are being lifted and divided, each individual planting hole will have to be prepared separately.

You will need a variety of tools. I find a knife, trowel, shovel spade and two digging forks will handle most plants. Occasionally a pruning saw and a hammer and wedge are needed. Through practice and experimentation you will find which tools work best on different plants.

Chrysanthemums, primroses and asters can be dug and will usually pull apart by hand. Each individual piece can be replanted to form a new blooming plant for the next season. Irises and other plants with thick rootstocks should be dug, have the soil cleaned off and cut with a sharp knife. Be sure to leave two or more eyes or buds on each piece of rootstock. Perennials with tightly interwrapped roots such as daylilies, hosta and liriope should be pried apart by using two digging forks placed back-to-back and operated like a pair of tongs. If it is impossible to separate the clump with the forks cut in with a spade or sharp shovel. *Yucca filamentosa* is the most difficult plant I've ever separated, and I finally had to resort to a wedge and sledge hammer to complete the job. Perennials that form a mat type of growth such as thyme, sedum and ajuga can be handled in two ways. First, the plants may be carefully lifted and then separated into individual plants and reset or if you are like me and usually in a hurry the mat can be cut with a spade into a square about the size of a potholder and reset the same way you would plant a "plug" of zoysia grass or crown vetch. It is important to make sure that each small square of the material has a good root system attached.

As with any form of propagation, cleanliness is essential. Each division should be groomed. Remove old, diseased or damaged leaves and roots. Check all root systems, but especially tubers and rhizomes for bores or fungus. If a problem is found treat it or discard the plant completely. Keep tools clean at all times. If a tool has been used to separate a plant that is diseased, dip it in alcohol before using it on another plant.

Contrary to popular belief, perennials are neither difficult nor maintenance free plants. With proper care and grooming, which includes a faithful schedule of division, perennials become the heirlooms of the garden.

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SOME PROPAGATING TECHNIQUES FOR YOUR WOODY PLANTS

by Gary L. Koller

Gary L. Koller is supervisor of the Arnold Arboretum's living collection in Boston, Massachusetts. Until last month Koller was curator of the Morris Arboretum.

Each year I propagate between 100 and 200 different woody plants from various botanical gardens, nurseries or private gardens. Many plants such as holly, evergreen azaleas and viburnum are widely propagated and the techniques are well-known. Many of the materials I work with, however, are unusual, and quick and easy methods of reproducing them are not known. With these plants I am often as lost as some people are who have never propagated a holly or forsythia from their own garden. What follows are the techniques I use on these unknowns; you can use the same process.

First and foremost you must correctly identify the kind of plant you are working with. With this information you can look to your reference guides for help. The genus name is most important because the literature gives recommendations based on broad groups such as prunus, syringa or forsythia rather than specific varieties. Barring information in the literature, I would consult with one of the many resource people who work at public horticultural institutions, a nurseryman or an amateur grower who specializes in the plant group I want to propagate. Plant propagators tend to be generous not only with cuttings but with swapping information. My motto is — When in doubt, ask.

stem cuttings

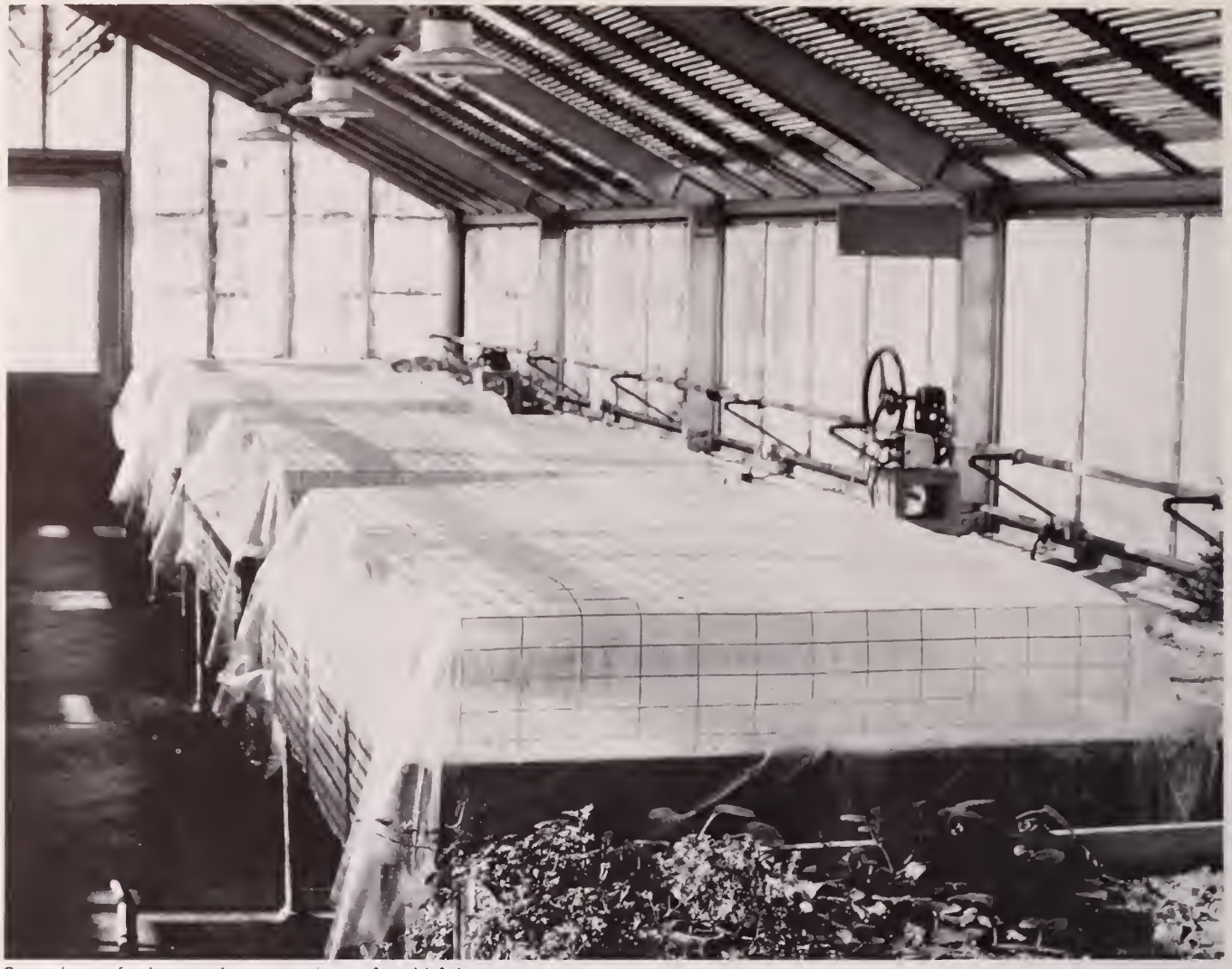
Cuttings of most woody plants are as easy to root as those of house plants and the same basic cultural procedures are involved. People are often unsuccessful, however, and the one most frequent

continued

photos by author



For home use — a wooden box covered with plastic (the end is uncovered for interior view only).



Sweat boxes for large-scale propagating at Arnold Arboretum.

mistake made is timing. The age of the stem that you hope to propagate largely determines your success. Most reference books talk about greenwood, softwood and hardwood cuttings when referring to the physiological age of the wood. Softwood or green cuttings are taken from the plant while it is in leaf and growth, thus providing half ripened wood; deciduous hardwood cuttings are taken from the leafless dormant plant, after it has finished and ripened its yearly growth. Evergreen hardwood is taken in the fall while the growth is on but dormant. To help the beginning propagator to get better results I have included a schedule that indicates times when cuttings of specific generic groups should be taken. These times are not absolutes, for many plants give good rooting percentages at other times, and different species and varieties within a genus will vary in their ability to root.

I prefer to take cuttings in the morning before the sun and heat have beaten down and depleted the plant's vitality. Terminal cuttings 6-8 in. long are taken and can be transported and stored in a plastic bag. Include several moist paper towels to help maintain humidity and keep the cuttings out of the sun. Greenwood and softwood cuttings should be processed as soon as possible but hardwood cuttings taken in auturm can be stored for a week or two in a refrigerator.

The cutting is prepared by making a fresh cut. Some people say between nodes but I do it at the node hoping that more carbohydrates, which stimulate rooting, are stored here. With many cuttings, especially hardwood, it helps to wound the stem to expose more of the active root-forming cambium tissue. This is done with a knife by removing a thin sliver of bark and wood about one-half inch long on two sides at the base of the stem. While all cuts are fresh, dip the base of the stem in one of the commercial root stimulating hormones. These hormones come in different strengths; when I am in doubt as to which will be most effective, I break the cuttings into several batches and treat each differently. Remember, strong concentrations of hormone sometimes burn plant tissue; if that has happened the base of the stem turns black within several days of treatment. Try a weaker hormone in that case.

Keep records during this whole process. Include date, hormone application, wounding and any other special treatment. When success occurs you can duplicate the results or share your experience with others.

From this stage on the cuttings are treated just as you would handle cuttings of house plants. Keep in mind that you need a soil mix dense enough to hold the cuttings erect and it should hold moisture but be well-drained. I

prefer a mix of two-thirds sand or perlite or a mix of both plus one-third peat or sphagnum moss.

One technique that speeds the rooting process is the application of bottom heat. This is easily accomplished with specially designed cables or mats which are available from many horticultural supply companies. The heating cable is put at the base of the soil mix and covered with hardware screen that protects the heating device from damage incurred in digging. In most the thermostat is preset to maintain a constant heat level in the area of the root zone

Maintaining high levels of atmospheric humidity is essential to the health and well-being of the cutting and largely determines your success as a propagator. This is most easily done with a sweat box. To make one, use a deep wooden box filled to three-quarters of its depth with the soil mix. Insert the cuttings, water in and cover with a sheet of plastic, completely enclosing the top and sides of the cutting box. Hold cover in place with thumb tacks. The plastic is held up above the foliage with hoops made from coat hangers or heavy twigs. (See Figure 1.)

Now, all that's needed are light, water and time. I must stress the importance of light. Some people assume that they can place the cuttings in the dark and get results. These cuttings still need light to produce food and the greater the food production the faster the cutting should root. Too much light will cause the plants to wilt rapidly due to excessive transpiration of water. You need as much light as possible without causing wilt symptoms and since there is no hard and fast rule, common sense dictates the light level that you need to maintain.

Here is a variation that is successful with hardwood cuttings of deciduous trees, shrubs and vines. With this technique you wait until frost has completely stopped all growth and the leaves have fallen away. Take cuttings 6-8 in. long, using the same technique as in the summer, bundle the cuttings into groups of 10 to 25, label and tie with string, keeping all of the tops pointing in one direction. After treating the cuttings with rooting hormones bury them in a safe, well-drained spot and mulch heavily so they will not freeze. They remain all winter and gradually undergo the initial processes necessary for root production. In late March or April, dig up the cuttings, separate and pot up or line into rows outdoors. Plant the cuttings deep enough so that only the upper two buds are above the soil line. Keep the cuttings watered; rooting should be completed over the next several weeks. This technique is very successful with forsythia, weigela, spiraea and ligustrum, to name only a few.

First blossom on rooted azalea cutting; a task well done



root cuttings

Many plants difficult or impossible to root from stem cuttings can be successfully increased from root cuttings. In late February through April root pieces 1/8 in. to 1/4 in. in diameter are dug and cut into pieces 2 in. to 3 in. long. At no point should these root pieces be allowed to dry out. Lay them horizontally on a soil bed and cover with a thin layer of soil. Keep the roots moist and as soon as they begin to sprout place them in a well-lit location. When the sprouts are several inches tall they can be lifted and potted as any other cutting.

continued

propagation continued

grafting

I resort to grafting, a difficult and time-consuming technique to master, for such plants as red delicious apple or weeping cherries, which do not reproduce from seeds or cuttings. Presently the most practical method of reproducing these plants is to grow quantities of seedlings onto which we graft a plant with known desirable characteristics. Even though the root and the top will connect and grow as one plant, the root always maintains its distinct characteristics and the top maintains characteristics displayed by the parent plant. This product represents another variation of maintaining a clonal variety, i e., any cuttings from the top of the graft will reproduce exactly as the parent.

The technique of grafting takes a cutting and joins it to an established root system, however, until the tissue unites and water and food move across the union, the top is as delicate as the stem cutting.

The main steps involved in grafting are getting the cambium or growth tissue of the top (scion) and the bottom (rootstock) into direct contact, keeping the exposed tissue from drying out and maintaining humidity around the scion or upper portion of the graft until the union is established. Because this technique is complex I suggest you read *The Grafters Handbook,* by Robert John Garner (Oxford University Press, New York, 1958) which gives you detailed, step-by-step procedures. Grafting is not difficult, however, it requires a good understanding of the factors involved in order to insure success.

I find propagation to be easy, fun and great therapy in a hectic world. It was my interest in propagation that led to my career in horticulture. With years of experience behind me I have had many successes, but I still have my share of failures. At present I am helping with a project where cuttings of *Kalopanax pictus* are taken at all seasons, treated with a variety of rooting hormones and planted in various rooting media; we've also manipulated other variables. After two years we have yet to produce a single rooted cutting. We won't give up because this plant, as have others, will eventually divulge the secret key to successful propagation and our work will pay off.

Should your first attempt fail, try again. Change the time, hormone treatment or soil mix, and you too will master the secret of plant multiplication.

Fat fleshy roots emerge on a cutting of mahonia.



KEY
(1) easy to root
(2) moderately easy to root
(3) difficult to root

SCHEDULE FOR CUTTINGS

Late June* — Greenwood Cuttings

Azalea, deciduous (2-3)
Cornus (3)
Enkianthus (3)
Hamamelis (3)
Pieris (2)
Prunus (3)
Syringa (3)

Mid-July through August — Softwood Cuttings

Abelia (1)
Abeliophyllum (1)
Acanthopanax (2)
Actinidia (2)
Ampelopsis (2)
Arctostaphylos (2)
Aronia (1)
Artemisia (1)
Aucuba (1)
Azalea, evergreen (1)
Berberis, deciduous (2)
Broussonetia (1)
Buddleia (1)
Callicarpa (2)
Calluna (1)
Calycanthus (1-2)
Camellia (2)
Caryopteris (1)
Cedrela (2)
Cephalanthus (2)
Chaenomeles (1)
Chimonanthus (2)
Cladrastis (2-3)
Clematis (2)
Clethra (3)
Corylopsis (2)
Cotinus (2)
Cotoneaster (1-2)
Cunninghamia (2)
Cyrilla (2)
Cytisus (1)
Daphne (2)
Davidia (2)
Deutzia (1)
Elaeagnus (2)
Elsholtzia (1)
Enkianthus (3)
Erica (1)
Euonymus (1)
Exochorda (2)
Fatsia (1)
Forsythia (1)
Fothergilla (2-3)
Franklinia (2)
Genista (1)
Halesia (2)
Hedera-juvenile (1)
Hibiscus (1)
Hydrangea (1)
Hypericum (1)
Iberis (1)
Jasminum (2)
Kalmia (3)
Kerria (1)
Kolkwitzia (1)
Lagerstroemia (1)
Ligustrum (1)
Liquidambar (2-3)
Lonicera (1)
Magnolia (2)
Mahonia (2)
Metasequoia (1)
Morus (1)
Myrica (2)
Nandina (1)
Pachysandra (1)
Phellodendron (2)
Philadelphus (1)
Photinia (2)
Physocarpus (1)
Pittosporum (2)
Populus (1)
Potentilla (2)
Pyracantha (1)
Rhododendron (2-3)
Rosa (1)
Salix (1)
Sambucus (1-2)
Santolina (1)
Sophora (2)
Spiraea (1)
Staphylea (2-3)
Stephanandra (1)
Stewartia (2)
Symphoricarpos (1)
Tamarix (1)
Teucrium (1)
Ulmus (2-3)
Vaccinium (2)
Viburnum (1-2)
Vitex (1)
Vitis (2)
Weigela (1)

After Killing Frost in Autumn — Deciduous Hardwood Cuttings (bury until spring)

Abeliophyllum (1)
Aronia (1)
Callicarpa (2)
Calycanthus (2)
Cephalanthus (1)
Chaenomeles (2)
Corylopsis (2)
Deutzia (1)
Exochorda (1)
Forsythia (1)
Fothergilla (2)
Franklinia (1)
Halesia (1)
Jasminum (1)
Kolkwitzia (1)
Ligustrum (1)
Lonicera (1)
Philadelphus (1)
Physocarpus (1)
Salix (1)
Spiraea (1)
Staphylea (2)
Viburnum (2)
Vitis (1)
Weigela (1)

After Killing Frost in Autumn — Evergreen Hardwood Cuttings

Berberis, evergreen (2)
Buxus (1)
Cephalotaxus (2)
Chamaecyparis (1)
Cryptomeria (2)
Cunninghamia (2)
Hedera, mature (3)
Ilex (1)
Juniperus (1-2)
Leucothoe (2)
Libocedrus (2)
Mahonia (2)
Nandina (1-2)
Osmanthus (1-2)
Pachistima (2-3)
Pieris (2)
Prunus, evergreen (1-2)
Sarcocca (2-3)
Sequoiadendron (1-2)
Skimmia (2)
Taxus (2)
Thuja (1-2)
Thujopsis (1-2)
Torreya (2-3)
Tsuga (2-3)

January through March — Root Cuttings

Albizia (1)
Alianthus (1)
Aralia (1)
Catalpa (1)
Cedrela (1)
Celastrus (1)
Cladrastis (1)
Elliottia (2)
Enkianthus (3)
Fothergilla (2)
Gymnocladus (1)
Koelreuteria (1)
Maackia (1)
Paulownia (1)
Phellodendron (1)
Rhus (1)
Xanthoceras (2)

Late February through March — Hardwood Cuttings, which are Potted Directly

Cytisus (1)
Franklinia (2)
Lonicera (1)
Salix (1)
Sophora (3)
Vitis (1)

*Times indicated are suggestions to help the beginning propagator get better results. These times are not absolutes and many plants give good rooting percentages at other times.

DAMPING-OFF COMPLEX

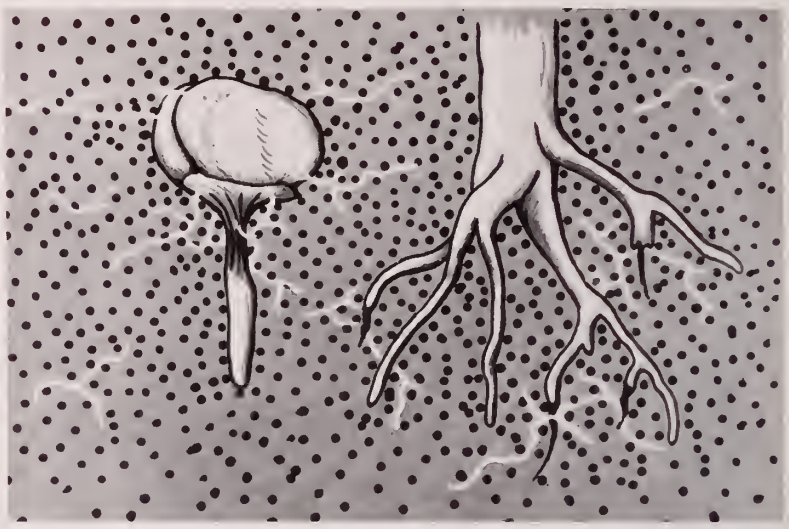


Figure 1
(Left) Excessive moisture creates thread-like fungus that attacks and kills the emerging seed Seed will never sprout roots.

(Right) Water mold fungus attacks tip of roots; if fungus grows up the root it will kill the plant.

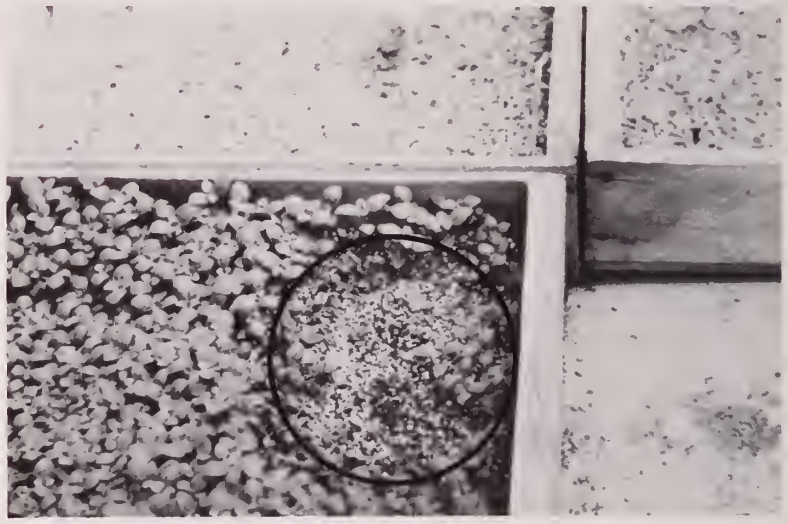


Figure 2
Plants in marked area have damped-off and toppled over. Damping-off pattern is almost circular.

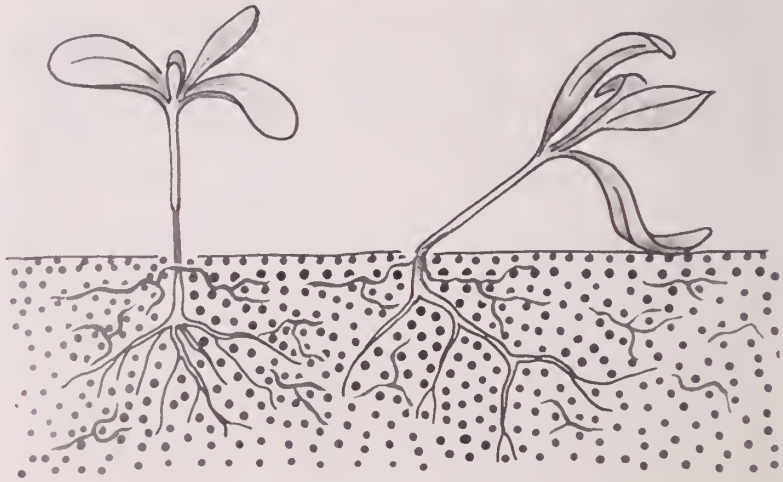


Figure 3
Plant on left remains standing after stem has been partially girdled by fungus. Stem has wire-like appearance and while it does not die it is stunted and worthless. Plant on right topples over when damped off.

One of the pleasures of gardening lies in the satisfaction of sowing the seed of annuals or perennials and watching the young seedlings develop into a beautiful garden. A major problem in growing flower seedlings is the disease complex called damping-off. The disease complex is one of the most serious soil-borne disease problems of the commercial producer of bedding plants and can be especially annoying to the home gardener.

Most gardeners consider damping-off as the stem collapse and falling over of seedlings. However, that is only one of several disease symptoms that may occur when seedlings are infected by one or more of the causal organisms.

Five forms of the damping-off complex are associated with the different stages of seedling development:

1. **Pre-emergence** (also known as seed decay). Damping-off organisms decay the seed or kill the germinated seedlings before they emerge from the soil (Fig. 1). Losses of this type are often blamed on poor seed; however, seed flats with much pre-emergence damping-off commonly show further heavy losses after emergence.

2. **Post-emergence** (this is the type of infection from which the name damping-off is derived). Stem tissue of the seedlings is invaded by one of the causal organisms at or near the soil surface. When the stem dies the seedling wilts and falls over (Figs. 2 and 3). Death occurs so quickly in many cases that the plants are found in a prostrate condition even before the tops have wilted. Infection may take place any time after the seedlings emerge from the soil and may continue as long as the stems remain tender.

3. **Wire stem.** Some seedlings may be so tough or the enironment so unfavorable for the growth of the causal organisms that the stem of the seedling may be only partially girdled and the plant remains alive and standing. Affected stems are often discolored and slightly constricted with a wire-like appearance, thus the name "wire stem." Affected plants usually do not die but remain stunted and worthless. Although the original infection most often occurs in the seed flat, the problem may not show up until after the plants are transplanted.

4. **Top rot or top damping-off.** Under conditions of continued high humidity resulting from excessive mist watering or overshading, *Rhizoctonia* or *Botrytis* fungi may grow up the stems of the seedlings to the leaves and spread from leaf to leaf forming a thick fungus mat. The tops of the plants may be killed to the soil level, and frequently the lower stem and roots are uninjured.

5. **Root rot.** Under conditions of high soil moisture the water mold fungi, *Pythium* and *Phytophthora,* may invade the tips of the roots, grow up into the stem and kill the seedling (Fig. 1, right). In some cases the advance of the fungus is slow and the seedlings become stunted, yellowed and lose the lower leaves.

cause of the damping-off complex

Although more than 30 different fungus pathogens may be associated with the damping-off complex, the most important are *Rhizoctonia* and species of two of the water molds, *Pythium* and *Phytophthora.*

Rhizoctonia. This fungus consists of brown threads or filaments called mycelium which grow between the soil particles and on organic matter. When the fungus comes in contact with a seedling, the threads of mycelium grow over the surface and penetrate the tissues to obtain nutrients. With the aid of a magnifying glass the brown threads of the fungus can be seen clinging to the decayed plant parts. Particles of sand or soil often adhere to the tough fungus threads. The threads may fuse together into small clumps or masses called sclerotia. These sclerotia are very resistant to heat and drying and may persist on dry soil particles clinging to a seed flat for as long as six months.

The *Rhizoctonia* fungus is spread by mechanical transfer of the fungus threads and sclerotia on infested soil particles and infected plant parts. During watering, bits of the fungus are splashed onto nearby flats. Bits of infested soil may become lodged in the end of the watering hose and be washed onto the soil in the flats. Infested soil may cling to flats, pots or tools. Clean flats placed on the ground or on unsterilized soil on benches may become infested with *Rhizoctonia* when infested soil is kicked or splashed into the flat. Roots from plants in flats grow through the bottom of the flat into the infested soil and become infected.

Water molds. The two important water mold fungi, *Pythium* and *Phytophthora,* are so called since they are

continued

by Lester P. Nichols

Professor Lester P. Nichols is a plant disease specialist in the Extension Service of The Pennsylvania State University. He works with ornamental plants including commercial greenhouse crops, commercial nursery crops, and shade trees. He has a special interest in the disease resistance of flowering crab apples.

DAMPING-OFF

usually damaging to seedlings only when the soil is very wet. *Rhizoctonia,* on the other hand, develops best when the soil is moderately moist. The fungus mycelium of the water molds is fine and colorless and grows between the soil particles in the top two or three inches of soil. It is more difficult to see with a magnifying glass than the mycelium of *Rhizoctonia.* Under favorable conditions the water molds produce swimming spores that move rapidly through water-filled soil spaces. These spores develop into mycelium, which penetrates the seedling roots. Generally, infection begins at the tips of the roots but decay is rapid and soon the entire root system is destroyed and the seedling falls over. The fungi form thick-walled resting spores in the tissue of diseased seedlings. These spores survive long periods of dryness and enable the fungi to be spread in dry soil or on tools, pots or flats. The swimming spores may be spread in drops of splashing water.

preventing the damping-off complex

Use treated soil mix. Since the pathogenic organisms that cause damping-off are primarily soil-borne, the best way to prevent the disease is to use a soil mix or propagating medium that has been steamed or chemically treated. These specially treated mixes or mediums may be obtained at a garden center or from a commercial greenhouse. Some gardeners prefer to treat their own soil mix at home in the oven, heating the soil in a pan or in the wooden seed flat to 180°F for one-half hour. Such treatment may emit a rather offensive odor, however.

Use new or treated containers. Use new containers for growing the seedlings where possible. Scrub used flats or pots clean of any soil and then dip for five minutes in a 10% solution of sodium hypochlorite (Clorox or other household bleach). Make a 10% solution by mixing 1 ounce of the bleach with 9 ounces of water. When using the bleach solution wear rubber gloves. An alternate method of treating wooden flats is to paint them with copper naphthenate (Cuprinol, Continental CNS Wood Preservative, or Cop-R-Nap). Such treatment will provide a continuous self-disinfesting surface for almost as long as the green color remains on the wood; however, it is advisable to retreat the wood annually.

Treat the seed. Treatment before planting will reduce pre-emergence damping-off and often provide an effective delay against the development of post-emergence damping-off. The treatment is aimed at killing pathogenic fungi, which may be found on the surface of the seed, and protecting the seed from decay before emergence. Thiram (sold as Science Thiram Seed Protectant 50%) is placed in the seed packet and the packet is shaken until all the seeds are well covered with the fungicide dust. For each seed packet use the amount of thiram that can be held on a quarter inch tip of a knife blade.

Use new seed. Reduced vitality of seed may delay the seedling's emergence and thus keep it in a susceptible state for a long time, which favors the incidence of damping-off. Plants grown from old, weak seed may show more damping-off than plants grown from new seed with high rapid germination.

Depth of planting. Do not plant the seed deeper than necessary since deep planting delays emergence of the seedlings with much the same effect as the use of old seed.

Plant seed in rows. Air movement is better around seedlings planted in rows than around seedlings broadcast in the flat and the increased air movement helps reduce the incidence of damping off. Also, damping-off is less likely to spread throughout a whole flat of seedlings when they are planted in rows.

Cover seed with sphagnum moss. A thin covering of finely pulverized sphagnum moss helps suppress the growth of the fungi that cause damping-off.

Control of watering and ventilation. After seeding, the flats should be watered only enough to obtain proper germination and growth. At no time should water be allowed to remain on the soil surface.

Thorough watering, with long intervals between, is more desirable than frequent light sprinkling. Water early in the morning, on sunny days if possible, to insure quick drying of the soil surface. Keep relative humidity low by placing a small fan so that there is slight air movement over the seed flats. Maintain the same temperature day and night to prevent variations in humidity. Don't put seedling and transplant flats in dark humid locations. Well-drained soil mixes help to suppress outbreaks of the damping-off problems caused by the water molds.

Have the soil tested. A complete soil test will show the presence of high concentrations of soluble salts, which may suppress germination, stunt the plants, or kill the seedlings. Levels of soluble salts not high enough to kill the plants but high enough to injure the plants may increase the severity of damping-off caused by *Rhizoctonia.*

Reduce the use of nitrogenous fertilizers. The higher the relative level of nitrogen in the soil, the softer the growth of the seedlings will be and the greater the susceptibility to damping-off.

Remember that the best way to avoid damping-off is a thorough preventive program before and after planting. Once damping-off has started, it may be difficult to stop and many seedlings will be lost.

PROPAGATING PLANTS WITHOUT THE SUN



photos by Claire Korsky

A 4-ft. long, two-bulb lamp fixture is the mimmum efficient size to be used for optimum light area, initial cost and replacement requirements. Note the woody material being propagated in the foreground.

by Dee Peck

Dee Peck is a charter member of the Philadelphia Indoor Light Gardening Society of America. She has been successively program chairperson, vice-president, and membership chairperson of the organization. She has also been actively involved in all of the PILGS exhibits at the Philadelphia Flower Show.

Under lights it is forever spring.

You are liberated from the calendar and are free to propagate plants, in any way, at any time of year. You can multiply your house plants surely and consistently, start seed for your annual and perennial beds, germinate fern spores, divide overgrown plants, and even start cuttings and seeds of woody material with a little extra care.

A minimal amount of equipment is necessary and it can be fitted into any odd available corner. Your initial purchase should be, ideally, a 4-ft. long, 40 watt, two-lamp fluorescent fixture in which the lamps are attached to the sides rather than below the channel. This can be mounted under a shelf — in a bookcase, over a counter in the kitchen or laundry, even an unused closet, or any other available spot, no matter how dark. If no shelves are available, units on legs can be purchased, and placed on an unused

continued



Cuttings ready to be inserted in vermiculite. They include begonia, sinningia, hibiscus, columnea, aeschynanthus and coleus.

table. If money and space are unlimited, an array of elaborate carts, units or even handsome furniture is flooding the market. Just take care that your choice incorporates the minimum fixture described.

The lamps used in the fixture need not be expensive "growth lamps." Experienced light gardeners have found that the ratio of one cool white fluorescent lamp to one warm white gives a growing spectrum adequate for all but the most specialized growing. The lamps should burn from 14 to 16 hours per day. Incandescent lamps add greatly to the operating expense and produce a great deal of unwanted heat.

If you have plenty of space and several light units, you might equip a complete shelf with plastic curtains, a bed of vermiculite and even a thermostatically controlled heating cable. However, most of us make do with simpler methods. A variety of clear plastic containers in various sizes are mandatory: small boxes for seed germination, and larger shoe, sweater, and hat boxes for rooting cuttings and transplanting seedlings. A supply of transparent plastic bags in assorted sizes can also be used in many ways. You will need the usual propagating materials: vermiculite, sphagnum peat, milled sphagnum moss, sand, and a soil or soilless mix. Of course a variety of plastic pots and some labels are essential.

The most common types of propagation under lights are starting seeds and rooting cuttings. Any of the usual methods and media may be used on seed, but the simple system I find most successful is as follows: in any small transparent clean container place a layer of vermiculite. Moisten it and pour off all excess water. On top of this place a 1/8- to 1/4-in. layer of very fine vermiculite, obtained by sieving regular vermiculite or pulverizing it in a blender. This layer need not be further moistened. Carefully scatter the seed on the surface but do not cover with medium unless seed is extremely large. Cover container securely with a transparent lid or with transparent food wrap. Place container under lights (distance is not too important at this stage) where bottom heat is available. The usual place is over the ballast of the fixture fastened to the shelf below. Germination is rapid, frequently within a week. Patience is required for laggards, but don't give up for a few months. With seeds of some perennial material, especially woody and alpine plants, a period in the refrigerator is often mandatory.

I transplant the seedlings as soon as possible, often before the true leaves appear. It depends on how tiny a seedling you are capable of seeing and handling. They go into a special soilless mix* initially, either two or three to a 2-in. pot, or into a community container, spaced about an inch apart.

*Formula: I use two parts sphagnum peat moss, one part perlite and one part vermiculite; add 1 tablespoon ground limestone per 5-6 qts.



Propagating herbaceous material in vermiculite in a closed container produces the rapid root formation shown here on pectranthus and episcia cuttings removed from the box in about two weeks.

They are again covered as above or placed in a plastic bag after judicious watering. This time they are placed within a few inches of the lights. When they are obviously growing, remove the plastic covering for a longer period each day until it can be left off (usually after about a week). From here on they are watered, fertilized, and transplanted the same as conventionally grown seedlings. Keep them a few inches from the lights, lowering the seedlings as they increase in size. If, as seldom happens, fungi intrude at any stage, a light misting with a Benomyl suspension is effective.

Germinating fern spores is almost as simple as seed. Containers, medium, and water should be sterile. Otherwise the procedure is the same. When prothallia appear, the surface of the medium is flooded with sterile water which is then poured off. The container is re-covered and placed in the dimmer area at the ends of the fluorescent lamps. When sporophytes (fern plantlets) are well started, plugs containing several young ferns are transplanted into individual pots and handled like the seedlings above, except that light requirement is considerably less.

Under lights, herbaceous cuttings root almost as you watch. Make cuttings as usual and bury two nodes deep in barely moist vermiculite in a transparent covered container (shoe or sweater box). After rooting they are handled like the seedlings above. Woody cuttings are somewhat trickier, but a friend of mine has developed a nearly fail-safe method. In late fall, cuttings are made, stripped of all but apical leaves, and the ends dipped in either Rootone F or No. 10, depending on the degree of bark formation. Three-inch plastic pots are filled with a 2:1:2 mix of Baccto soil, perlite, and sand. The cuttings are placed in the pots, firmed, bottom watered and covered loosely with sandwich bags. They are then placed 6 in. from the lights. *Lonicera nitida, Hydrangea quercifolia, Elaeagnus pungens, Virburnum rhytidophyllum,* and *Syringa persica laciniata* were rooted in about a month. The speed champ was *Abelia grandiflora*—well under a month! They continue to grow throughout the winter, blooming and requiring pruning. In spring they are hardened, weaned from the lights and placed in shaded, sheltered outdoor beds. Some material, such as berberis and osmanthus, was not successful. You should experiment to determine special requirements.

There are many other ways of propagating vegetatively and all are adaptable to under-light culture. Multiple crown plants can be divided; rhizomes and runners can be rooted; air layering can be accomplished; tubers, corms, bulbils and viviparous plantlets can be started; spring bulbs can be forced. All the rules are much the same as with conventional methods, except that you have at your disposal a cool, steady, reliable substitute for the sun.

•

by Charles Heuser

Charles W. Heuser is associate professor of horticulture physiology at Penn State University. Heuser has published research papers on various aspects of plant propagation including tissue culture, grafting and root initiation.

propagation in the Buck Rogers



Tissue culture equipment including culture containers, tweezers, pipette, test tubes and rack, scalpel and spatula.

The technique described in this article promises rapid propagation from a single piece of a plant. The new method could revolutionize parts of the commercial growers industry; e.g., within a year one piece of plant could produce a million plants. You don't need elaborate greenhouses with misting systems either. The author says the plants can be raised in a basement under lights.

mode: TISSUE CULTURE

After reading all of the articles in this issue of *Green Scene* that discuss the "tried and true" methods of plant propagation, consider the challenge of experiments with the tissue culture or micropropagation technique. Plant propagation through tissue culture is a relatively new procedure whereby tiny pieces of plants are grown in specially prepared mixtures of inorganic nutrients and organic compounds like sugars, vitamins and hormones.

Tissue culture propagation offers two significant advantages: (1) the possibility of recovering disease-free varieties, and (2) the rapid increase of selected varieties. The theoretical possibilities of tissue culture make this technique truly exciting because it is possible to produce a million plants in one year from a single small piece of plant tissue.

Propagating plants in test tubes sounds like science fiction. Commercial acceptance of the procedure, however, tells us it is not. General interest in plant propagation through tissue culture is attributed to the commercial success with orchids, which are slow to increase and often expensive. From the initial work of Dr. G. Morel of France, 16 years ago on the rapid vegetative propagation of cymbidium orchids, the pace has quickened. Each year we read about an ever-increasing number of plants that can be propagated using this method: orchid, carnation, gloxinia, fern, daylily, iris and many others can now be multiplied by tissue culture.

Serious horticulturists considering micropropagation experiments will find the procedure an interesting and educational experience. Commercial plant propagators as well as amateurs, from school children to retired citizens, can enjoy tissue culture propagation. It's an excellent science fair project and will give plant students a unique way to learn about growth and development, and nutritional requirements of plants. All you need is the use of a pressure cooker, analytical balance and pH meter, and you can investigate the world of propagation through tissue culture.

culture medium requirements

Recommendations for nutrient media differ in the tissue culture literature. The ingredients of a defined tissue culture medium consist of mineral salts, carbon source, vitamins and hormones. Although several mineral salt recipes are available, the Murashige and Skoog high salt mixture has worked with a wide range of plant species (see Table 1). The Murashige and Skoog high salt mixture can be purchased from a number of commercial firms as a premixed powder (see reading suggestions and supply sources).

The purpose of the carbon source is to provide a readily available supply of energy for the growing tissue. Sucrose is the most suitable carbon source.

Thiamine appears to be the vitamin most often required. The vitamins pyridoxine and nicotinic acid frequently improve culture growth and are added.

Growth regulators or hormones, such as auxins and cytokinins, are important for all tissue culture media. Their proper balance and selection is critical in the production of shoots and roots. Auxins such as indoleacetic acid, naphthaleneacetic acid (NAA), and 2,4-dichlorophenoxyacetic acid (2,4-D) are commonly used. Naphthaleneacetic acid is familiar to anyone who has rooted cuttings as a synthetic rooting hormone. Cytokinins like

continued

table 1

Murashige and Skoog High Salt Medium[1]	
NH_4NO_3	1650 mg/L
KNO_3	1900 mg/L
$CaCl_2 \cdot 2H_2O$	440 mg/L
$MgSO_4 \cdot 7H_2O$	370 mg/L
KH_2PO_4	170 mg/L
$FeSO_4 \cdot 7H_2O$	27.8 mg/L
Na_2EDTA	37.3 mg/L
H_3BO_3	6.2 mg/L
$MnSO_4 \cdot 4H_2O$	22.3 mg/L
$ZnSO_4 \cdot 4H_2O$	8.6 mg/L
KI	0.83 mg/L
$Na_2MoO_4 \cdot 2H_2O$	0.25 mg/L
$CoCl_2 \cdot 6H_2O$	0.025 mg/L
$CuSO_4 \cdot 5H_2O$	0.025 mg/L
Note: Chelated iron (Fe) is supplied by mixing $FeSO_4$ and NaEDTA.	
Hormonal Substances	
Auxins	0.1-10 mg/L
Cytokinins	0.01-30 mg/L
Vitamins	
Meso-inositol	100 mg/L
Nicotinic acid	0.5 mg/L
Pyridoxine	0.5 mg/L
Thiamine	1.0 mg/L
Sugars	
Sucrose	10-30 g/L
Agar	
Difco agar	6-10 g/L

[1] Murashige, T., and F. Skoog. 1962. A revised medium for rapid growth and bioassays with tobacco tissue cultures. *Physiol. Plant.* 15:473-97.

TISSUE CULTURE

benzyladenine and kinetin are the other required phytohormones. Occasionally, mention is made of undefined organic supplements like coconut milk at 10-15% or casein hydrolysate at 100-1000 mg/liter being required.

The nutrient medium components are dissolved in distilled or demineralized water. Don't use tap water because it may contain toxic substances. To simplify media preparation, it is advantageous to make and store stock solutions of the various components. Inorganic salts and vitamin stock solutions at 100 times concentration may be made and stored in the refrigerator until used. Vitamin stock solutions, however, should be stored frozen. Growth regulator stock solution preparations require special procedures because of a solubility problem. Auxins, such as NAA, are dissolved by placing 50 mg in 2-5 ml of alcohol and quickly diluted to 100 ml with distilled water after being dissolved. A cytokinin stock solution is made by dissolving 20 mg of kinetin or benzyladenine in a small volume of 0.5 normal hydrochloric acid and diluting to 100 ml.

The theoretical possibilities of tissue culture make this technique truly exciting because it is possible to produce a million plants in one year from a single small piece of plant tissue.

media preparation

The chemicals, usually enough for 1 liter of media, are dissolved in distilled water or the stock solutions are mixed in a large erlenmeyer flask (pyrex type) and the pH is adjusted. It's important to mix the media components in the quantities specified; excess amounts can prove toxic. The pH can be adjusted with 1.0 normal potassium hydroxide solution if too acidic or 1.0 normal hydrochloric acid solution if too basic. After pH adjustment, add sugar and agar together with enough water to make up the desired volume. Agar is insoluble in cold water and must be heated like gelatin to dissolve it. Avoid breaking the flask by placing an asbestos-wire pad under the container. Bring the solution to the boiling point while stirring until the agar is dissolved (when it becomes translucent or transparent). Do not let the solution foam. At this stage it can be poured into culture containers. A wide range of containers including jars, flasks or test tubes can be used. It is best, however, to use pyrex containers. Container closures should prevent recontamination after sterilization and allow aeration but retard moisture loss. Bakelite screw



Callus growing on an agar medium in a flask.



Plantlet formation from callus of daylily.

caps, nonabsorbent cotton or special plastic covers can be used. After the media is poured into the containers and capped, it is ready to be sterilized.

You can sterilize using your kitchen pressure cooker. Follow the directions for your particular model. After the media is sterilized, store it in the refrigerator.

isolation and culturing of plant tissues

The tiny pieces of plants used to initiate a culture are called explants. Almost any plant part can be used to produce callus tissue. The ability of the callus to produce plantlets varies widely depending on the particular species and plant part (organ). Special conditions for successful plant regeneration must be developed for each plant species. For example, with hemerocallis, daylily, only bud tissues are easily induced to initiate shoots and complete plants. In other plants a wide variety of explant sources including bulb scales, shoot tips, stems, leaves, seedlings and embryos, and inflorescences have been successfully used for tissue culture propagation.

Plant tissues are contaminated with bacteria and fungi and these microorganisms must be removed because the culture medium provides a suitable growing environment for microorganisms and they would soon outgrow the cultures. Surface sterilization with 5% chlorox for 5-15 minutes will usually destroy the organisms. It often helps to add a drop of liquid detergent solution. After disinfecting, rinse the tissue three times in sterilized water. At this time the explant may be further trimmed to remove any parts damaged by the sterilization. In working with some plant organs that are in contact with the soil, e.g. roots, it may be necessary to sterilize in several steps.

Instruments, such as razor blades, scalpels or tweezers, used to manipulate the tissue explants before and after sterilization can be disinfected by dipping in 95% alcohol followed by "flaming" with an alcohol lamp. **Because of alcohol's flammability use it with utmost care around a flame.**

Cleanliness is essential in all tissue culture work. Tissue culture propagation should be performed in a clean room free of dust and with no air currents. All work surfaces should be disinfected with alcohol or chlorox before use. A simple sterile working area can be provided by sterilizing sheets of newspaper with a pressure cooker and working between the sterile sheets. (Newspapers are folded, placed in the pressure cooker and sterilized using routine canning procedure.)

continued



Daylily plantlets rooting in test tubes.



Young plant produced by culturing flower parts.



Flowering daylily produced by culturing flower bud tissues.

TISSUE CULTURE

culture environment

Proper temperature and light conditions are required for success with tissue culture. The light requirement is much lower than that normally associated with growing plants. In practice, a low light intensity of 100-500 foot candles for 12-16 hours per day is used. This light can be easily supplied by a fluorescent source. A constant temperature of approximately 25°C (77°F) is standard.

Now that you are familiar with tissue culture methodology you are ready to experiment. I do not guarantee your success, but good luck with your adventure. In choosing a plant to experiment with, remember that herbaceous plants work best. Woody perennial plants are very difficult and little success has been obtained.

procedures for culturing daylily

Here is how we have propagated daylilies through tissue culture. Cut buds approximately 0.5 centimeters long from a flower stalk and disinfect for five minutes in 5% chlorox. After sterilizing, rinse the buds with sterile water. The sepals and petals are removed from the bud and placed in bottles or test tubes containing the Murashige and Skoog high salt medium. Kinetin (1 mg/L) and 2,4-D (1 mg/L) are the hormones added. Sucrose and the vitamins thiamine, pyridoxine and nicotinic acid are also added. Low light or no light is satisfactory at this stage.

After induction the callus tissue is transferred to a new medium and grown under low light. In this second stage of culture, 2,4-D is left out of the medium. Shoot and root production should occur. Complete plants can be removed and transferred to soil. The new plants at this stage are very tender and protection is necessary.

Now if you're lucky you will have hundreds of plants of your favorite daylily cultivar. If you end up with a jar full of fungi you'll have discovered the need for scientific procedure. Regardless, you will have to admit tissue culture is a very interesting and educational experience in plant propagation.

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Units of Measurement
- Gram (g) = 1/454 of a lb.
- Milligram (mg) = 1/1000 of a gram
- Liter (L) = 1.057 quarts
- Milliliter (ml) = 1/1000 of a liter
- Normal solution (N) = equivalents of solute contained in 1 liter of solution

Tissue Culture Supplies

Premixed Salts: GIBCO, 5508 Telegraph Ave., Oakland, California
Colorado Serum Company

Chemicals and Materials: Curtin Scientific Co.; Fisher Scientific Co.; ICN Pharmaceuticals, Inc.; J. T. Baker Laboratory Chemicals and Products; Matheson, Coleman and Bell; Scientific Products; Sigma Chemical Co.; Flow Laboratories

books on propagation

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Morris, Julie — From Seed to Flower, Philadelphia 1681-1876 — A Horticultural Point of View . . Mar., 30

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Nichols, Lester P. — Damping-Off Complex July, 18

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Patten, Williams S. — *Daphne genkwa* . . . Sept., 32
Peck, Dee — *Pellaea rotundifolia* . . . Jan., 32; Propagating Plants Without the Sun . . . July, 21
Peck, Frederick W. G. — Growing Garden Annuals from Seed . . . July, 9
Prichard, Kathryn L. — Becoming a Shrinker Jan., 2

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Raden, Lee — Ah . . . The Silvers . . . Nov., 26; Growing Plants from Seed . . . July, 7
Riemer, Jan — A Different Kind of Survival Kit . . . Mar., 12; *Helianthus tuberosus* . . . Sept., 33; Herb Reigns Supreme . . . May, 28

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West, Franklin H. — Rhododendrons in the Delaware Valley . . . May, 1
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My Memorial Gardens

by Edgar T. Wherry

Propagation techniques ensure the continuity of special gardens established as a memorial for a beloved botanist who named many of the plants in the garden. Edgar T. Wherry tells how he designed his own memorial gardens and worked out a way to protect against the disappearance of these rare plants.

When my days are done, I would rather be remembered by the living plants that have meant so much to me during my lifetime, instead of a lifeless stone slab. I realized that if these plants were assembled at a horticultural institution and propagated and distributed for the enjoyment of everyone, continuity would be assured.

I first began to develop such a collection below the rose garden at the Morris Arboretum. Because rabbits are especially fond of phlox, which I had planned to grow extensively, we surrounded the beds with wire netting. Soon, however, the whole slope from the rock wall down was infested with burrowing short-tailed mice; they devoured the roots of every plant. Director John M. Fogg, Jr., of the Barnes Arboretum in Merion, then suggested a garden southwest of the Art Gallery where mice were not a problem. Landscape architect John S. Kistler developed a 10 ft. x 40 ft. plot studded with sandstone slabs surrounded by crushed hard shale that worked very well. For species from special habitats individual strips were veneered by serpentine gravel, silica sand, flaky shale and broken limestone; and at the east end a large lilac bush furnished shade for woodland dwellers.

Since solitary plantings may be destroyed by accident, divisions of each were planted in secondary plots, one at the campus of Friends Central School in Overbrook, and another at the wild flower garden of Mr. & Mrs. H. H. Brenneman in Chester Heights, Delaware County. Losses from one garden can then be replaced by plants from another.

plant list

Bog plant. *Sarracenia jonesi* W.*

High-Plains plant. *Phlox variabilis.*

Limestone plants. *Heuchera pubescens* cv. Begonia W., *Opuntia calcicola* W., *Phlox bifida* ssp. *stellaria* W., *Sedum pulchellum, Viola walteri.*

Serpentine-Barren plants. *Adiantum pedatum* var. *aleuticum, Phlox hirsuta, P. subulata, Talinum teretifolium.*

Shale-Barren plants. *Allium oxyphilum* W., *Antennaria virginica argillicola, Aster oblongifolius orientis, Astragalus distortus, Clematis albicoma* W., *Erigonum alleni, Oenothera argillicola, Paronychia virginica, Phlox buckleyi* W., *P. subulata* ssp. *brittoni* W., *Sedum telephioides* cv. Tony W., *Senecio antennariifolius, Spiraea corymbosa, Trifolium virginicum.*

Woodland plants. *Claytonia virginica forma lutea, Collinsia verna, Cymophyllus fraseri, Heuchera villosa* cv. Royal Robe W., *Hexastylis virginica, Meehania cordata, Phlox stolonifera* cv. Ariane, cv. Bluette W., cv. Daybreak W., cv. Home Fires W., cv. Melrose W., *Tiarella cordifolia* ssp. *collina* W., *T. wherryi, Viola appalachiensis.*

Plants of various habitats. *Amsonia hubrichtii, Aster oblongifolius* var. *angustatis, Chrysogonum virginianum, Conradina verticillata, Coreopsis auriculata, C. verticillata, Cunila origanoides, Cuthbertia rosea, Dicentra eximia* cv. Snowdrift W., *Dodecatheon amethystinum, Gaylussacia brachycera* cv. Baird W., cv. Canby W., cv. Don Smith W., cv. Parson Gray W., cv. Plitt W., cv. Ward W., *Ipomopsis rubra, Lithospermum canescens, Phlox amoena, P. bifida, P. bifida* cv. Starbright, *P. carolina* ssp. *alta, P. divaricata* ssp. *laphami* W., *P. glaberrima* ssp. *interior* W., ssp. *triflora* W., *P.* X *glutinosa* cv. Chattahoochee, *P.* X *henryae* W., *P. nivalis* cv. Camla, cv. Gladwyne W., cv. Sylvestris, *Polemonium pauciflorum, P. reptans, P. reptans* var. *album, P. vanbruntiae, Spigelia marilandica.*

Ferns (in Laura L. Barnes Fern Dell). *Dryopteris* X *australis* W., *D.* X *dowellii* W., *D.* X *leedsii* W., *D.* X *neowherryi, D.* X Shawmont W., *D.* X *slossonae* W., *D.* X *triploidea* W.

*"W" following a name indicates my authorship; cv. — cultivar; ssp. — subspecies.

growing interests

Mrs. J. Pancoast Reath is a member of the Four Counties Garden Club, past member of PHS Council and national chairperson for Horticulture, Garden Club of America. She is an accredited GCA judge. Mrs. Reath says she is an amateur whose specialty is everything. She has won the horticultural sweepstakes at the Philadelphia Flower & Garden Show several times in the past.

franklinia alatamaha

After reading Barbara Emerson's article about *Franklinia alatamaha (Green Scene,* March, '76) readers may be interested in my experiments with propagating the plant from cuttings. I had almost 100% success rooting many types of cuttings—softwood with buds taken in early July, hardwood taken in late fall, heel cuttings 5-6 in. long, tip cuttings 3-4 in. long. The buds were removed and with a sharp, clean razor blade a shallow 1-in. long wound was made through the outer bark. Dipped in Hormodin 3, the cuttings were then submerged 1½ in. deep in a medium of one-half coarse sand and one-half sifted leaf mold, with bottom heat at 70° F. Although not essential to success, using an automatic mist system greatly reduced the risk of any drying out which is lethal and also helped to keep the cuttings clean and free from disease. The greenhouse is partially shaded in the summer months. In a period of three and a half months, softwood cuttings taken in early July had formed excellent root growth. The hardwood cuttings taken in late fall took about four months to develop good roots.

That's where I ran into trouble. These experiments began in 1972; each year I was successful rooting the various cuttings, and each year all of the cuttings perished over the winter, after being potted up into 3-in. pots. All experiments I tried failed—the potting medium was varied in each experiment; overwintering some in a cold frame and

continued



some in the greenhouse proved fruitless. In the end, credit must go to James S. Wells, whose book *Plant Propagation Practices* suggested a solution (see book list on p. 29). I rooted softwood cuttings taken in early July 1975 and followed the same procedures as in the past, but potted them into 3-in. clay pots of pure sphagnum moss, a much lighter medium than I had used before. These small plants have overwintered in my greenhouse at 50° night temperature. All 22 cuttings have survived and are putting out vigorous, healthy growth.

The mistake I made was in the medium I used when potting up. A mistake I would perhaps not have made had I considered more carefully the natural habitat of *F. alatamaha* — native, as it is, of "sand hill bogs bordering swamps," one realizes that it will probably require an acid, open and moisture retentive material in which to grow.

Mrs. J. Pancoast Reath

nymphaea



Copied from Three Spring Fisheries (Lilypons, Md.) catalog with permission.

Robert Ryan says "he has had only six or seven years of experience" with water lilies and needs about ten more before he gets it down to a science. At present he has a couple of pools where he grows lilies in his garden.

There are two types of hardy water lilies that are common in the northeast: the various nymphaea, which bear the many pointed, star-shaped flowers that one thinks of as water lilies, and the nuphar or bullhead lilies with a less spectacular yellow flower. The nymphaea are the obvious choice for the gardener who wants to grow hardy lilies in a small backyard pool. All types can winter in pools, provided the roots themselves do not actually freeze. In this area, nine inches of water between the top of the plant container and the surface of the pool ought to be sufficient in most winters.

In the typical backyard pool, hardy lilies are best grown in containers. Large plastic tubs or flowerpots lined with plastic, 12 in. in diameter do the job nicely. From the plant's point of view, the larger the pot the better, but there is a practical limitation here. It is easier to clean the pools if you can move the pots, and a water logged 12-in. pot is the largest that most people can lift. The typical unpromising looking lily plant purchased in May will, by autumn, totally occupy the pot.[1] To give the plant "room" to grow next year, it is necessary to remove most of the root material. That will give you all of the material that you need for propagation.

I use a crude but effective "quartering" technique. When you remove the plant mass from the container, you will notice that the root system consists of brownish tubers and a mass of softer, white feeder roots. Next year's plants will grow from the tubers and particularly from "bud-like" growths on the tubers. Using a spade, divide the plant into quarters, leaving a substantial part of the tuberous material in each portion that you expect to use for propagation. Plant each quarter in a separate container, filling the balance with a heavy, clay soil that makes the kind of rich mud that lilies like. I'm sure it is possible to divide plants in such a way that a quarter will not produce a lily next year, but so long as the quarters that you replant have a substantial tuberous section, it is unlikely. At least it has never happened to me. Rather, the problem lies in the other direction, for if the pruning is not drastic enough, the quarters that you return to the container will contain more than one bud, which means that next year the container will have to support two, three or four plants, none of which will do very well. You can reduce this possibility by picking off any obvious excess tuber "buds," but there is no sure cure except to remove shoots after the growing season starts.

One fairly obvious point should be mentioned. Label your pots. While you will know in the summer which pot contains the particularly attractive white lily that you have decided to propagate, it is very easy to mix up the pots once the flowers are gone and end up propagating the plant you didn't particularly like, while throwing your favorite away.

Robert Ryan

[1] This type of rapid multiplication is characteristic of the odorosa and tuberosa lilies. The hybrid marliac lilies, which are hardy, multiply less quickly, and require division less frequently.

viola pedata

Our handsomest native violet is *Viola pedata*. It has been known since 1688 when it was described by John Barrister. Commonly called the bird's foot violet because of its finely divided foliage, the typical form is a lovely bi-color, the two upper petals being velvety purple with the three bottom ones pale lavender. *V. pedata linearíloba,* the common form, has all five petals pale bluish-lavender. There is also a rarer all white form.

This violet grows on open, well-drained slopes in very sterile acid soils. It will succeed in the garden only if given similar conditions. Drainage is the most important factor.

This year, I wanted to collect *V. pedata* seed to increase my planting. The plants bloomed beautifully over quite an extended period, so it looked promising for a good seed collection. No seeds developed through the summer. *V. pedata* does not have cleistogamous flowers, so no seed for the season.

How then do you propagate this violet? It does not form runners, so no cutting material is available. It has a thick knobby underground stem with fleshy roots, so division is impossible. Root cuttings are the recommended method.

Carefully dig up your *V. pedata* and gently shake the soil off the roots and the knobby stem. Find a thick root and carefully cut the top with a straight cut. (Use a slanting stroke to sever the lower end; the flat end will be a guide to planting the top end at the proper level.) One authority says to remove any minor roots on this thick root, but I have always left them and had no problems. It is safe to remove approximately 1/3 of the big fleshy roots and not damage your plant. These roots are cut into 1½-in. long pieces. Replant your mother plant, keeping it shaded and well watered for several days. Good as new.

Before you sever the roots, ready your area for propagation. I use an area that has good light and air circulation. It is under a bench in my "Alpine House," so is shady enough that the medium does not dry out too fast. In this area, I have builder's sand mixed with a little humus (about one part humus to eight parts sand – pretty sandy!). Here I make a row of vertical root sections about 1 in. apart with the flat top of the cutting just covered with sand. (Be sure to label the row with plant name and date of insertion.) Water this row lightly daily with a rose nozzle on the hose. Since there is no visible foliage to transpire moisture, less water is needed than for stem cuttings. This sand-humus mix—about 6 in. deep—is well-drained but retains moisture.

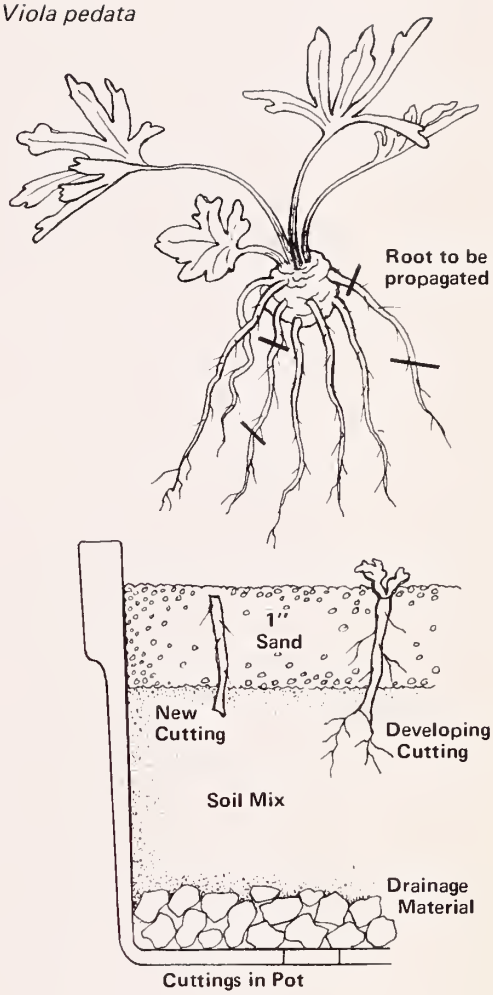
In about four weeks, tiny green spots appear as the leaves begin to develop on the flat top of the root. Do nôt hurry to move or disturb these little plantlets. When they are fairly well developed, then prick out as you would a row of seedlings. Carefully pot up each plant. The best time to make root cuttings is March and April when the plants are in active growth. I prefer to keep these potted cuttings in pots until planting time the following spring. These plants from rooted cuttings will be an exact replica of the parent plant, except variegated plants will not carry the variegation into the root cutting.

A clay pot may be used instead of my sand method. The pot is crocked 1 in. deep at the bottom for drainage, then filled with the sand-humus mix, topped by 1 in. of builder's sand. Insert the root cuttings in the vertical position, being sure the top of the root is at the top. Place the pot in container of water until surface is wet, let drain, and insert pot into plastic bag and close bag. If too much moisture collects on the plastic, reverse the bag. Keep track until the leaves develop. Open the bag gradually to harden off the plantlets for the drier air. Place the pot in a light but no-sun location. Be sure the sand does not dry out; water when needed. Keep moist but not soggy.

Many other plants can be increased by root cuttings: anchusa, *Anemone japonica* and *pulsatilla, Asclepias sp., Astilbe sp., Dodecatheon meadia, Dicentra spectabilis, Gypsophila paniculata,* alpine geraniums, morisia, *Papaver sp., Paeonia sp., Polygonatum sp., Primula denticulata, Trollius sp., Yucca sp.,* and *Xanthoceras sorbifolia.*

Anita Kistler

Viola pedata



Anita Kistler enjoys propagating and says it's not as hard as people have been led to believe. Each year she grows approximately 500 new varieties from seed and admits that not all germinate. In addition, whenever she gets a new plant, she always takes two or more cuttings in case the plant doesn't succeed when transplanted. Her chief interest is in rock garden and alpine plants.



The Buck Rogers Age of Propagation: Plantlets developing from daylily callus. Tissue culture propagation can produce a million plants within a year. See article on page 24.

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